

***What Is Claimed Is:***

1. A composition for enhancing an immune response in an animal comprising:

- (a) a virus-like particle; and
- (b) an immunostimulatory substance;

wherein said immunostimulatory substance is bound to said virus-like particle.

2. The composition of claim 1 further comprising at least one antigen, wherein said antigen is bound to said virus-like particle.

3. The composition of claim 1, wherein said immunostimulatory substance is a toll-like receptor activating substance.

4. The composition of claim 1, wherein said immunostimulatory substance is a cytokine secretion inducing substance.

5. The composition of claim 3, wherein said toll-like receptor activating substance is selected from the group consisting of, or alternatively consists essentially of:

- (a) immunostimulatory nucleic acids;
- (b) peptidoglycans;
- (c) lipopolysaccharides;
- (d) lipoteichonic acids;
- (e) imidazoquinoline compounds;
- (f) flagellines;
- (g) lipoproteins;
- (h) immunostimulatory organic molecules;
- (i) unmethylated CpG-containing oligonucleotides; and
- (j) any mixtures of at least one substance of (a), (b), (c), (d), (e), (f), (g), (h) and/or (i).

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6. The composition of claim 5, wherein said immunostimulatory nucleic acid is selected from the group consisting of, or alternatively consists essentially of:

- (a) ribonucleic acids;
- (b) deoxyribonucleic acids;
- (c) chimeric nucleic acids; and
- (d) any mixtures of at least one nucleic acid of (a), (b) and/or (c).

7. The composition of claim 6, wherein said ribonucleic acid is poly-(I:C) or a derivative thereof.

8. The composition of claim 6, wherein said deoxyribonucleic acid is selected from the group consisting of, or alternatively consists essentially of:

- (a) unmethylated CpG-containing oligonucleotides; and
- (b) oligonucleotides free of unmethylated CpG motifs.

9. The composition of claim 1, wherein said immunostimulatory substance is an unmethylated CpG-containing oligonucleotide.

10. The composition of claim 1, wherein said virus-like particle lacks a lipoprotein-containing envelope.

11. The composition of claim 1, wherein said virus-like particle is a recombinant virus-like particle.

12. The composition of claim 11, wherein said virus-like particle is selected from the group consisting of:

- (a) recombinant proteins of Hepatitis B virus;

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- (b) recombinant proteins of measles virus;
- (c) recombinant proteins of Sinbis virus;
- (d) recombinant proteins of Rotavirus;
- (e) recombinant proteins of Foot-and-Mouth-Disease virus;
- (f) recombinant proteins of Retrovirus;
- (g) recombinant proteins of Norwalk virus;
- (h) recombinant proteins of human Papilloma virus;
- (i) recombinant proteins of BK virus;
- (j) recombinant proteins of bacteriophages;
- (k) recombinant proteins of RNA-phages;
- (l) recombinant proteins of Q $\beta$ -phage;
- (m) recombinant proteins of GA-phage
- (n) recombinant proteins of fr-phage;
- (o) recombinant proteins of AP 205-phage;
- (p) recombinant proteins of Ty; and
- (q) fragments of any of the recombinant proteins from (a) to (p).

13. The composition of claim 12, wherein said virus-like particle is the Hepatitis B virus core protein.

14. The composition of claim 12, wherein said virus-like particle is the BK virus VP1 protein.

15. The composition of claim 1, wherein said virus-like particle comprises recombinant proteins, or fragments thereof, of a RNA-phage.

16. The composition of claim 15, wherein said RNA-phage is selected from the group consisting of:

- (a) bacteriophage Q $\beta$ ;
- (b) bacteriophage R17;

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- (c) bacteriophage fr;
- (d) bacteriophage GA;
- (e) bacteriophage SP;
- (f) bacteriophage MS2;
- (g) bacteriophage M11;
- (h) bacteriophage MX1;
- (i) bacteriophage NL95;
- (k) bacteriophage f2;
- (l) bacteriophage PP7; and
- (m) bacteriophage AP205.

17. The composition of claim 1, wherein said virus-like particle comprises recombinant proteins, or fragments thereof, of RNA-phage Q $\beta$ .

18. The composition of claim 1, wherein said virus-like particle comprises recombinant proteins, or fragments thereof, of RNA-phage AP 205.

19. The composition of claim 9, wherein said unmethylated CpG-containing oligonucleotide comprises the sequence:



wherein  $X_1$ ,  $X_2$ ,  $X_3$ , and  $X_4$  are any nucleotide.

20. The composition of claim 19, wherein at least one of said nucleotide  $X_1$ ,  $X_2$ ,  $X_3$ , and  $X_4$  has a phosphate backbone modification.

21. The composition of claim 9, wherein said unmethylated CpG-containing oligonucleotide comprises, or alternatively consists essentially of, or alternatively consists of the sequence selected from the group consisting of:

- (a) TCCATGACGTTCTGAATAAT;
- (b) TCCATGACGTTCTGACGTT;
- (c) GGGGTCAACGTTGAGGGGG;



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- (d) GGGGGGGGGGGGACGATCGTCGGGGGGGGGGG;  
and
- (e) "dsCyCpG-253" as described in Table 1.

22. The composition of claim 21, wherein said unmethylated CpG-containing oligonucleotide contains one or more phosphorothioate modifications of the phosphate backbone or wherein each phosphate moiety of said phosphate backbone of said oligonucleotide is a phosphorothioate modification.

23. The composition of claim 9, wherein said unmethylated CpG-containing oligonucleotide is palindromic.

24. The composition of claim 23, wherein said palindromic unmethylated CpG-containing oligonucleotide comprises, or alternatively consists essentially of, or alternatively consists of the sequence GGGGTCAACGTTGAGGGGG.

25. The composition of claim 24, wherein said palindromic unmethylated CpG-containing oligonucleotide contains one or more phosphorothioate modifications of the phosphate backbone or wherein each phosphate moiety of said phosphate backbone of said oligonucleotide is a phosphorothioate modification.

26. The composition of claim 1, wherein said immunostimulatory substance is non-covalently bound to said virus-like particle.

27. The composition of claim 9, wherein said unmethylated CpG-containing oligonucleotide is non-covalently bound to said virus-like particle.

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28. The composition of claim 5, wherein said immunostimulatory nucleic acid is bound to a virus-like particle site selected from the group consisting of an oligonucleotide binding site, a DNA binding site and a RNA binding site.

29. The composition of claim 9, wherein said unmethylated CpG-containing oligonucleotide is bound to a virus-like particle site selected from the group consisting of an oligonucleotide binding site, a DNA binding site and a RNA binding site.

30. The composition of claim 29, wherein said oligonucleotide binding site is a non-naturally occurring oligonucleotide binding site.

31. The composition of claim 29, wherein said virus-like particle site comprises an arginine-rich repeat.

32. The composition of claim 5, wherein said immunostimulatory nucleic acid contains one or more phosphorothioate modifications of the phosphate backbone or wherein each phosphate moiety of said phosphate backbone of said oligonucleotide is a phosphorothioate modification.

33. The composition of claim 9, wherein said unmethylated CpG-containing oligonucleotide contains one or more phosphorothioate modifications of the phosphate backbone or wherein each phosphate moiety of said phosphate backbone of said oligonucleotide is a phosphorothioate modification.

34. The composition of claim 5, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises about 6 to about 100,000 nucleotides.

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35. The composition of claim 34, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises about 6 to about 2000 nucleotides.

36. The composition of claim 35, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises about 20 to about 2000 nucleotides.

37. The composition of claim 36, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises about 20 to about 300 nucleotides.

38. The composition of claim 37, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises 20 to 100 nucleotides.

39. The composition of claim 5, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises more than 100 to about 2000 nucleotides.

40. The composition of claim 39, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises more than 100 to about 1000 nucleotides.

41. The composition of claim 40, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises more than 100 to about 500 nucleotides.

42. The composition of claim 5, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a recombinant oligonucleotide.

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43. The composition of claim 5, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a genomic oligonucleotide.

44. The composition of claim 5, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a synthetic oligonucleotide.

45. The composition of claim 5, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a plasmid-derived oligonucleotide.

46. The composition of claim 5, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a single-stranded oligonucleotide.

47. The composition of claim 5, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a double-stranded oligonucleotide.

48. The composition of claim 2, wherein said at least one antigen or antigenic determinant is bound to said virus-like particle by at least one covalent bond.

49. The composition of claim 2, wherein said at least one antigen or antigenic determinant is bound to said virus-like particle by at least one covalent bond, and wherein said covalent bond is a non-peptide bond.

50. The composition of claim 2, wherein said at least one antigen or antigenic determinant is fused to said virus-like particle.

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51. The composition of claim 2, wherein said antigen or antigenic determinant further comprises at least one second attachment site being selected from the group consisting of:

- (a) an attachment site not naturally occurring with said antigen or antigenic determinant; and
- (b) an attachment site naturally occurring with said antigen or antigenic determinant.

52. The composition of claim 2 further comprising an amino acid linker, wherein said amino acid linker comprises, or alternatively consists of, said second attachment site.

53. The composition of claim 2, wherein said antigen is selected from the group consisting of:

- (a) polypeptides;
- (b) carbohydrates;
- (c) steroid hormones; and
- (d) organic molecules.

54. The composition of claim 53, wherein said antigen is an organic molecule.

55. The composition of claim 54, wherein said organic molecule is selected from the group consisting of:

- (a) codeine;
- (b) fentanyl;
- (c) heroin;
- (d) morphium;
- (e) amphetamine;
- (f) cocaine;

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- (g) methylenedioxymethamphetamine;
- (h) methamphetamine;
- (i) methylphenidate;
- (j) nicotine;
- (k) LSD;
- (l) mescaline;
- (m) psilocybin; and
- (n) tetrahydrocannabinol.

56. The composition of claim 2, wherein said antigen is a recombinant antigen.

57. The composition of claim 2, wherein said antigen is derived from the group consisting of:

- (a) viruses;
- (b) bacteria;
- (c) parasites;
- (d) prions;
- (e) tumors;
- (f) self-molecules;
- (g) non-peptidic hapten molecules
- (h) allergens; and
- (i) hormones.

58. The composition of claim 57, wherein said antigen is a tumor antigen.

59. The composition of claim 58, wherein said tumor antigen is selected from the group consisting of:

- (a) Her2;
- (b) GD2;

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- (c) EGF-R;
- (d) CEA;
- (e) CD52;
- (f) CD21;
- (g) human melanoma protein gp100;
- (h) human melanoma protein melan-A/MART-1;
- (i) tyrosinase;
- (j) NA17-A nt protein;
- (k) MAGE-3 protein;
- (l) p53 protein;
- (m) HPV16 E7 protein; and
- (n) antigenic fragments of any of the tumor antigens from (a) to (m).

60. The composition of claim 2, wherein said antigen is bound to said virus-like particle by way of a linking sequence.

61. The composition of claim 60, wherein said virus-like particle is the Hepatitis B virus core protein.

62. The composition of claim 60, wherein said virus-like particle is the BK virus core protein.

63. The composition of claim 2, wherein said antigen is a cytotoxic T cell epitope, a Th cell epitope or a combination of at least two of said epitopes, wherein said at least two epitopes are bound directly or by way of a linking sequence.

64. The composition of claim 63, wherein said cytotoxic T cell epitope is a viral or a tumor cytotoxic T cell epitope.

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65. The composition of claim 63, wherein said antigen is bound to said virus-like particle by way of a linking sequence.

66. The composition of claim 63, wherein said virus-like particle is the Hepatitis B virus core protein.

67. The composition of claim 66, wherein said cytotoxic T cell epitope is fused to the C-terminus of said Hepatitis B virus core protein.

68. The composition of claim 67, wherein said cytotoxic T cell epitope is fused to the C-terminus of said Hepatitis B virus core protein by way of a linking sequence.

69. The composition of claim 63, wherein said virus-like particle is the BK virus VP1 protein.

70. The composition of claim 69, wherein said cytotoxic T cell epitope is fused to the C-terminus of said BK virus VP1 protein.

71. The composition of claim 70, wherein said cytotoxic T cell epitope is fused to the C-terminus of said BK virus VP1 protein by way of a linking sequence.

72. A method for enhancing an immune response in an animal comprising introducing into said animal a composition comprising:

- (a) a virus-like particle; and
- (b) an immunostimulatory substance;

wherein said immunostimulatory substance is bound to said virus-like particle.

73. The method of claim 72, wherein said composition further comprises an antigen, wherein said antigen is bound to said virus-like particle.



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74. The method of claim 72, wherein said immunostimulatory substance is a toll-like receptor activating substance.

75. The method of claim 72, wherein said immunostimulatory substance is a cytokine secretion inducing substance.

76. The method of claim 74, wherein said toll-like receptor activating substance is selected from the group consisting of, or alternatively consists essentially of:

- (a) immunostimulatory nucleic acids;
- (b) peptidoglycans;
- (c) lipopolysaccharides;
- (d) lipoteichonic acids;
- (e) imidazoquinoline compounds;
- (f) flagellines;
- (g) lipoproteins;
- (h) immunostimulatory organic molecules;
- (i) unmethylated CpG-containing oligonucleotides; and
- (j) any mixtures of at least one substance of (a), (b), (c), (d), (e), (f), (g), (h) and/or (i).

77. The method of claim 76, wherein said immunostimulatory nucleic acid is selected from the group consisting of, or alternatively consists essentially of:

- (a) ribonucleic acids;
- (b) deoxyribonucleic acids;
- (c) chimeric nucleic acids; and
- (d) any mixtures of at least one nucleic acid of (a), (b) and/or (c).

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78. The method of claim 77, wherein said ribonucleic acid is poly-(I:C) or a derivative thereof.

79. The method of claim 77, wherein said deoxyribonucleic acid is selected from the group consisting of, or alternatively consists essentially of:

- (a) unmethylated CpG-containing oligonucleotides; and
- (b) oligonucleotides free of unmethylated CpG motifs.

80. The method of claim 72, wherein said immunostimulatory substance is an unmethylated CpG-containing oligonucleotide.

81. The method of claim 72, wherein said virus-like particle lacks a lipoprotein-containing envelope.

82. The method of claim 72, wherein said virus-like particle is a recombinant virus-like particle.

83. The method of claim 82, wherein said virus-like particle is selected from the group consisting of:

- (a) recombinant proteins of Hepatitis B virus;
- (b) recombinant proteins of measles virus;
- (c) recombinant proteins of Sinbis virus;
- (d) recombinant proteins of Rotavirus;
- (e) recombinant proteins of Foot-and-Mouth-Disease virus;
- (f) recombinant proteins of Retrovirus;
- (g) recombinant proteins of Norwalk virus;
- (h) recombinant proteins of human Papilloma virus;
- (i) recombinant proteins of BK virus;
- (j) recombinant proteins of bacteriophages;
- (k) recombinant proteins of RNA-phages;
- (l) recombinant proteins of Q $\beta$ -phage;

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- (m) recombinant proteins of GA-phage;
- (n) recombinant proteins of fr-phage;
- (o) recombinant proteins of AP 205-phage;
- (p) recombinant proteins of Ty; and
- (q) fragments of any of the recombinant proteins from (a) to (p).

84. The method of claim 83, wherein said virus-like particle is the Hepatitis B virus core protein.

85. The method of claim 83, wherein said virus-like particle is the BK virus VP1 protein.

86. The method of claim 72, wherein said virus-like particle comprises recombinant proteins, or fragments thereof, of a RNA-phage.

87. The method of claim 86, wherein said RNA-phage is selected from the group consisting of:

- (a) bacteriophage Q $\beta$ ;
- (b) bacteriophage R17;
- (c) bacteriophage fr;
- (d) bacteriophage GA;
- (e) bacteriophage SP;
- (f) bacteriophage MS2;
- (g) bacteriophage M11;
- (h) bacteriophage MX1;
- (i) bacteriophage NL95;
- (k) bacteriophage f2;
- (l) bacteriophage PP7; and
- (m) bacteriophage AP205.

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88. The method of claim 72, wherein said virus-like particle comprises recombinant proteins, or fragments thereof, of RNA-phage Q $\beta$ .

89. The method of claim 72, wherein said virus-like particle comprises recombinant proteins, or fragments thereof, of RNA-phage AP 205.

90. The method of claim 80, wherein said unmethylated CpG-containing oligonucleotide comprises the sequence:



wherein  $X_1$ ,  $X_2$ ,  $X_3$ , and  $X_4$  are any nucleotide.

91. The method of claim 90, wherein at least one of said nucleotide  $X_1$ ,  $X_2$ ,  $X_3$ , and  $X_4$  has a phosphate backbone modification.

92. The method of claim 80, wherein said unmethylated CpG-containing oligonucleotide comprises, or alternatively consists essentially of, or alternatively consists of the sequence selected from the group consisting of:

- (a) TCCATGACGTTCTGAATAAT;
- (b) TCCATGACGTTCTGACGTT;
- (c) GGGGTCAACGTTGAGGGGG;
- (d) GGGGGGGGGGACGATCGTCGGGGGGGGGG;
- and
- (e) "dsCyCpG-253" as described in Table 1.

93. The method of claim 92, wherein said unmethylated CpG-containing oligonucleotide contains one or more phosphorothioate modifications of the phosphate backbone or wherein each phosphate moiety of said phosphate backbone of said oligonucleotide is a phosphorothioate modification.

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94. The method of claim 80, wherein said unmethylated CpG-containing oligonucleotide is palindromic.

95. The method of claim 94, wherein said palindromic unmethylated CpG-containing oligonucleotide comprises, or alternatively consists essentially of, or alternatively consists of the sequence GGGGTCAACGTTGAGGGGG.

96. The method of claim 95, wherein said palindromic unmethylated CpG-containing oligonucleotide contains one or more phosphorothioate modifications of the phosphate backbone or wherein each phosphate moiety of said phosphate backbone of said oligonucleotide is a phosphorothioate modification.

97. The method of claim 72, wherein said immunostimulatory substance is non-covalently bound to said virus-like particle.

98. The method of claim 72, wherein said virus-like particle is produced in a bacterial expression system.

99. The method of claim 72, wherein said virus-like particle is produced in a yeast expression system.

100. The method of claim 80, wherein said unmethylated CpG-containing oligonucleotide is non-covalently bound to said virus-like particle.

101. The method of claim 72, wherein said immunostimulatory substance is packaged, preferably enclosed by said virus-like particle.

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102. The method of claim 80, wherein said unmethylated CpG-containing oligonucleotide is packaged, preferably enclosed by said virus-like particle.

103. The method of claim 76, wherein said immunostimulatory nucleic acid is bound to a virus-like particle site selected from the group consisting of an oligonucleotide binding site, a DNA binding site and a RNA binding site

104. The method of claim 80, wherein said unmethylated CpG-containing oligonucleotide is bound to a virus-like particle site selected from the group consisting of an oligonucleotide binding site, a DNA binding site and a RNA binding site.

105. The method of claim 104, wherein said oligonucleotide binding site is a non-naturally occurring oligonucleotide binding site.

106. The method of claim 104, wherein said virus-like particle site comprises an arginine-rich repeat.

107. The method of claim 76, wherein said immunostimulatory nucleic acid contains one or more phosphorothioate modifications of the phosphate backbone or wherein each phosphate moiety of said phosphate backbone of said oligonucleotide is a phosphorothioate modification.

108. The method of claim 80, wherein said unmethylated CpG-containing oligonucleotide contains one or more phosphorothioate modifications of the phosphate backbone or wherein each phosphate moiety of said phosphate backbone of said oligonucleotide is a phosphorothioate modification.

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109. The method of claim 76, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises about 6 to about 100,000 nucleotides.

110. The method of claim 109, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises about 6 to about 2000 nucleotides.

111. The method of claim 110, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises about 20 to about 2000 nucleotides.

112. The method of claim 111, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises about 20 to about 300 nucleotides.

113. The method of claim 112, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises 20 to 100 nucleotides.

114. The method of claim 76, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises more than 100 to about 2000 nucleotides.

115. The method of claim 114, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises more than 100 to about 1000 nucleotides.

116. The method of claim 115, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide comprises more than 100 to about 500 nucleotides.

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117. The method of claim 76, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a recombinant oligonucleotide.

118. The method of claim 76, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a genomic oligonucleotide.

119. The method of claim 76, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a synthetic oligonucleotide.

120. The method of claim 76, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a plasmid-derived oligonucleotide.

121. The method of claim 76, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a single-stranded oligonucleotide.

122. The method of claim 76, wherein said immunostimulatory nucleic acid, and preferably said unmethylated CpG-containing oligonucleotide is a double-stranded oligonucleotide.

123. The method of claim 73, wherein said at least one antigen or antigenic determinant is bound to said virus-like particle by at least one covalent bond.



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124. The method of claim 73, wherein said at least one antigen or antigenic determinant is bound to said virus-like particle by at least one covalent bond, and wherein said covalent bond is a non-peptide bond.

125. The method of claim 73, wherein said at least one antigen or antigenic determinant is fused to said virus-like particle.

126. The method of claim 73, wherein said antigen or antigenic determinant further comprises at least one second attachment site selected from the group consisting of:

- (a) an attachment site not naturally occurring with said antigen or antigenic determinant; and
- (b) an attachment site naturally occurring with said antigen or antigenic determinant.

127. The method of claim 73, further comprising an amino acid linker, wherein said amino acid linker comprises, or alternatively consists of, said second attachment site.

128. The method of claim 73, wherein said antigen is selected from the group consisting of:

- (a) polypeptides;
- (b) carbohydrates;
- (c) steroid hormones; and
- (d) organic molecules.

129. The method of claim 128, wherein said antigen is an organic molecule.

130. The method of claim 129, wherein said organic molecule is selected from the group consisting of:

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- (a) codeine;
- (b) fentanyl;
- (c) heroin;
- (d) morphium;
- (e) amphetamine;
- (f) cocaine;
- (g) methylenedioxymethamphetamine;
- (h) methamphetamine;
- (i) methylphenidate;
- (j) nicotine;
- (k) LSD;
- (l) mescaline;
- (m) psilocybin; and
- (n) tetrahydrocannabinol.

131. The method of claim 73, wherein said antigen is a recombinant antigen.

132. The method of claim 73, wherein said antigen is derived from the group consisting of:

- (a) viruses;
- (b) bacteria;
- (c) parasites;
- (d) prions;
- (e) tumors;
- (f) self-molecules;
- (g) non-peptidic hapten molecules
- (h) allergens; and
- (i) hormones.

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133. The method of claim 132, wherein said antigen is a tumor antigen.

134. The method of claim 133, wherein said tumor antigen is selected from the group consisting of:

- (a) Her2;
- (b) GD2;
- (c) EGF-R;
- (d) CEA;
- (e) CD52;
- (f) CD21;
- (g) human melanoma protein gp100;
- (h) human melanoma protein melan-A/MART-1;
- (i) tyrosinase;
- (j) NA17-A nt protein;
- (k) MAGE-3 protein;
- (l) p53 protein;
- (m) HPV16 E7 protein; and
- (m) antigenic fragments of any of the tumor antigens from (a) to (m).

135. The method of claim 73, wherein said antigen is bound to said virus-like particle by way of a linking sequence.

136. The method of claim 135, wherein said virus-like particle is the Hepatitis B virus core protein.

137. The method of claim 135, wherein said virus-like particle is the BK virus VP1 protein.

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138. The method of claim 73, wherein said antigen is a cytotoxic T cell epitope, a Th cell epitope or a combination of at least two of said epitopes, wherein said at least two epitopes are linked directly or by way of a linking sequence.

139. The method of claim 138, wherein said cytotoxic T cell epitope is a viral or a tumor cytotoxic T cell epitope.

140. The method of claim 138, wherein said antigen is bound to said virus-like particle by way of a linking sequence.

141. The method of claim 138, wherein said virus-like particle is the Hepatitis B virus core protein.

142. The method of claim 141, wherein said cytotoxic T cell epitope is fused to the C-terminus of said Hepatitis B virus core protein.

143. The method of claim 142, wherein said cytotoxic T cell epitope is fused to the C-terminus of said Hepatitis B virus core protein by way of a linking sequence.

144. The method of claim 138, wherein said virus-like particle is a BK virus VP1 protein.

145. The method of claim 144, wherein said cytotoxic T cell epitope is fused to the C-terminus of said BK virus VP1 protein.

146. The method of claim 145, wherein said cytotoxic T cell epitope is fused to the C-terminus of said BK virus VP1 protein by way of a linking sequence.

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147. The method of claim 72, wherein said immune response is an enhanced B cell response.

148. The method of claim 72, wherein said immune response is an enhanced T cell response.

149. The method of claim 148, wherein said T cell response is a CTL response.

150. The method of claim 148, wherein said T cell response is a Th cell response.

151. The method of claim 150, wherein said Th cell response is a Th1 cell response.

152. The method of claim 72, wherein said animal is a mammal.

153. The method of claim 152, wherein said mammal is a human.

154. The method of claim 72, wherein said composition is introduced into said animal subcutaneously, intramuscularly, intravenously, intranasally or directly into the lymph node.

155. A method of producing a composition for enhancing an immune response in an animal comprising a virus-like particle and an immunostimulatory substance bound to said virus-like particle which comprises:

- (a) incubating said virus-like particle with said immunostimulatory substance;
- (b) adding RNase; and
- (c) purifying said composition.

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156. The method of claim 155, wherein said immunostimulatory substance is an immunostimulatory nucleic acid selected from the group consisting of, or alternatively consists essentially of:

- (a) ribonucleic acids;
- (b) deoxyribonucleic acids;
- (c) chimeric nucleic acids; and
- (d) any mixtures of at least one nucleic acid of (a), (b) and/or (c).

157. The method of claim 156, wherein said ribonucleic acid is poly-(I:C) or a derivative thereof.

158. The method of claim 156, wherein said deoxyribonucleic acid is selected from the group consisting of, or alternatively consists essentially of:

- (a) unmethylated CpG-containing oligonucleotides; and
- (b) oligonucleotides free of unmethylated CpG motifs.

159. The method of claim 155, wherein said immunostimulatory substance is an unmethylated CpG-containing oligonucleotide.

160. The method of claim 155, wherein said virus-like particle is produced in a bacterial expression system.

161. The method of claim 155, wherein said RNase is RNase A.

162. A method of producing a composition for enhancing an immune response in an animal comprising a virus-like particle and an immunostimulatory substance bound to said virus-like particle which comprises:

- (a) incubating said virus-like particle with RNase;

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- (b) adding said immunostimulatory substance; and
- (c) purifying said composition.

163. The method of claim 162, wherein said immunostimulatory substance is an immunostimulatory nucleic acid selected from the group consisting of, or alternatively consists essentially of:

- (a) ribonucleic acids;
- (b) deoxyribonucleic acids;
- (c) chimeric nucleic acids; and
- (d) any mixtures of at least one nucleic acid of (a), (b) and/or (c).

164. The method of claim 163, wherein said ribonucleic acid is poly-(I:C) or a derivative thereof.

165. The method of claim 163, wherein said deoxyribonucleic acid is selected from the group consisting of, or alternatively consists essentially of:

- (a) unmethylated CpG-containing oligonucleotides; and
- (b) oligonucleotides free of unmethylated CpG motifs.

166. The method of claim 162, wherein said immunostimulatory substance is an unmethylated CpG-containing oligonucleotide.

167. The method of claim 162, wherein said virus-like particle is produced in a bacterial expression system.

168. The method of claim 162, wherein said RNase is RNase A.

169. A method of producing a composition for enhancing an immune response in an animal comprising a virus-like particle and an

- 182 -

immunostimulatory substance bound to said virus-like particle which comprises:

- (a) disassembling said virus-like particle;
- (b) adding said immunostimulatory substance; and
- (c) reassembling said virus-like particle.

170. The method of claim 169, wherein said immunostimulatory substance is an immunostimulatory nucleic acid selected from the group consisting of, or alternatively consists essentially of:

- (a) ribonucleic acids;
- (b) deoxyribonucleic acids;
- (c) chimeric nucleic acids; and
- (d) any mixtures of at least one nucleic acid of (a), (b) and/or (c).

171. The method of claim 170, wherein said ribonucleic acid is poly-(I:C) or a derivative thereof.

172. The method of claim 170, wherein said deoxyribonucleic acid is selected from the group consisting of, or alternatively consists essentially of:

- (a) unmethylated CpG-containing oligonucleotides; and
- (b) oligonucleotides free of unmethylated CpG motifs.

173. The method of claim 169, wherein said immunostimulatory substance is an unmethylated CpG-containing oligonucleotide.

174. The method of claim 169 further comprising removing nucleic acids of said disassembled virus-like particle.

175. The method of claim 169 further comprising purifying said composition after reassembly (c).



- 183 -

176. A method of producing a composition for enhancing an immune response in an animal comprising a virus-like particle and an immunostimulatory substance bound to said virus-like particle which comprises:

- (a) incubating said virus-like particle with solutions comprising metal ions capable of hydrolyzing the nucleic acids of said virus-like particle;
- (b) adding said immunostimulatory substance; and
- (c) purifying said composition.

177. The method of claim 176, wherein said immunostimulatory substance is an immunostimulatory nucleic acid selected from the group consisting of, or alternatively consists essentially of:

- (a) ribonucleic acids;
- (b) deoxyribonucleic acids;
- (c) chimeric nucleic acids; and
- (d) any mixtures of at least one nucleic acid of (a), (b) and/or (c).

178. The method of claim 177, wherein said ribonucleic acid is poly-(I:C) or a derivative thereof.

179. The method of claim 177, wherein said deoxyribonucleic acid is selected from the group consisting of, or alternatively consists essentially of:

- (a) unmethylated CpG-containing oligonucleotides; and
- (b) oligonucleotides free of unmethylated CpG motifs.

180. The method of claim 176, wherein said immunostimulatory substance is an unmethylated CpG-containing oligonucleotide.

- 184 -

181. The method of claim 176, wherein said metal ions are selected from the group consisting of:

- (a) zinc (Zn) ions;
- (b) copper (Cu) ions;
- (c) iron (Fe) ions; and
- (d) any mixtures of at least one ion of (a), (b) and/or (c).

182. A vaccine comprising an immunologically effective amount of the composition of claim 1 together with a pharmaceutically acceptable diluent, carrier or excipient.

183. The vaccine of claim 182 further comprising an adjuvant.

184. A method of immunizing or treating an animal comprising administering to said animal an immunologically effective amount of the vaccine of claim 182.

185. The method of claim 184, wherein said animal is a mammal.

186. The method of claim 185, wherein said mammal is a human.

187. A vaccine comprising an immunologically effective amount of the composition of claim 2 together with a pharmaceutically acceptable diluent, carrier or excipient.

188. The vaccine of claim 187 further comprising an adjuvant.

189. A method of immunizing or treating an animal comprising administering to said animal an immunologically effective amount of the vaccine of claim 187.

- 185 -

190. The method of claim 189, wherein said animal is a mammal.

191. The method of claim 190, wherein said mammal is a human.

192. A method of immunizing or treating an animal comprising priming a T cell response in said animal by administering an immunologically effective amount of the vaccine of claim 182.

193. The method of claim 192, further comprising the step of boosting the immune response in said animal.

194. The method of claim 193, wherein said boosting is effected by administering an immunologically effective amount of a vaccine of claim 182 or an immunologically effective amount of a heterologous vaccine.

195. The method of claim 194, wherein said heterologous vaccine is a DNA vaccine.

196. A method of immunizing or treating an animal comprising boosting a T cell response in said animal by administering an immunologically effective amount of the vaccine of claim 182.

197. The method of claim 196, further comprising the step of priming a T cell response in said animal.

198. The method of claim 197, wherein said priming is effected by administering an immunologically effective amount of a vaccine of claim 182 or an immunologically effective amount of a heterologous vaccine.

199. The method of claim 198, wherein said heterologous vaccine is a DNA vaccine.

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200. A method of immunizing or treating an animal comprising priming a T cell response in said animal by administering an immunologically effective amount of the vaccine of claim 187.

201. The method of claim 200 further comprising the step of boosting the immune response in said animal.

202. The method of claim 201, wherein said boosting is effected by administering an immunologically effective amount of a vaccine of claim 187 or an immunologically effective amount of a heterologous vaccine.

203. The method of claim 202, wherein said heterologous vaccine is a DNA vaccine or a viral vaccine or a canary pox vaccine.

204. A method of immunizing or treating an animal comprising boosting a T cell response in said animal by administering an immunologically effective amount of the vaccine of claim 187.

205. The method of claim 204, further comprising the step of priming a T cell response in said animal.

206. The method of claim 205, wherein said priming is effected by administering an immunologically effective amount of a vaccine of claim 187 or an immunologically effective amount of a heterologous vaccine.

207. The method of claim 206, wherein said heterologous vaccine is a DNA vaccine or a viral vaccine or a canary pox vaccine.

## Fig. 1

A

5' TCCATGACGTTCCCTGAATAAT 3'

B

1 atggacattg acccttataa agaatttggg gctactgtgg agttactctc gtttttgccct tctgacttct tctctccgt cagagatctc ctagacaccg  
 M D I D P Y K E F G A T V E L L S F L P S D F F P S V R D L L D T

101 cctcagctct gtaacgagaa gccttagagt ctctcgagca ttgctacact caccatactg cactcaggca agccattctc tgctgggggg aattgatgac  
 A S A L Y R E A L E S P E H C S P H H T A L R Q A I L C W G E L M

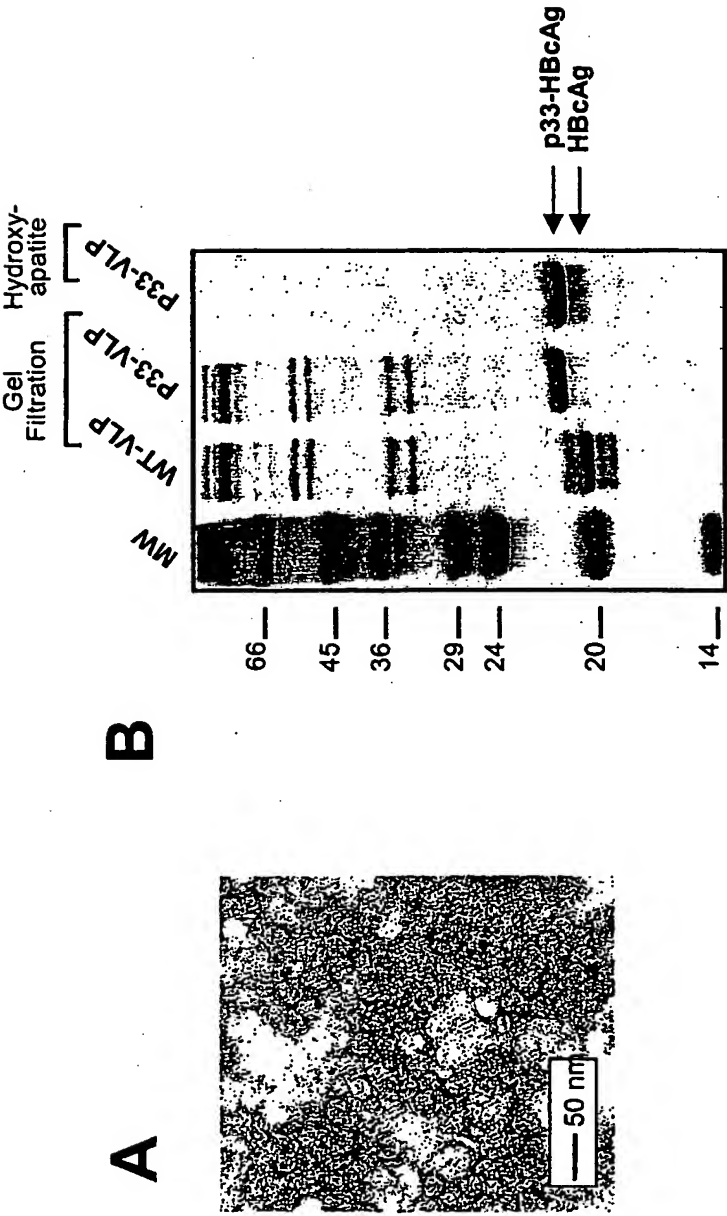
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 T L A T W V G N N L E D P A S R D L V V N Y V N T N M G L K I R Q L

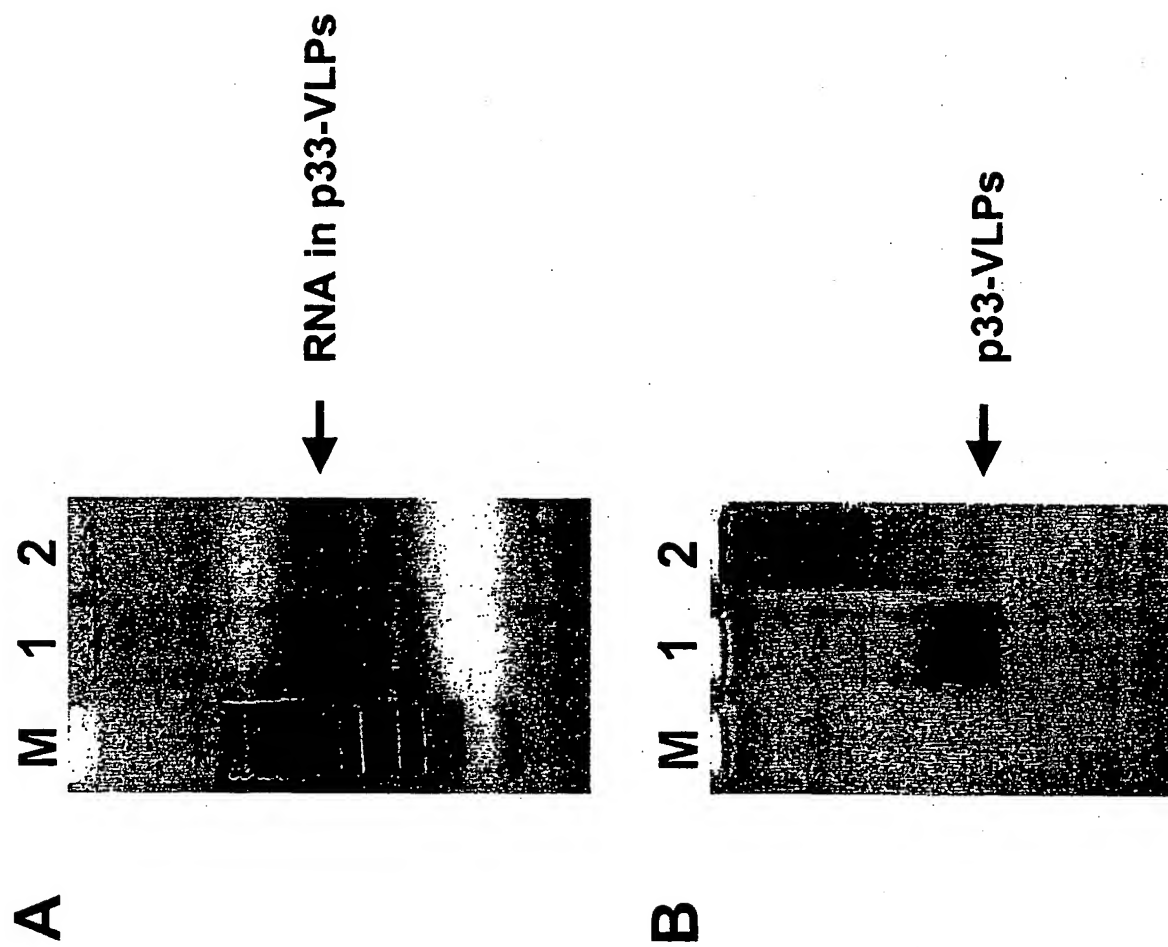
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 L W F H I S C L T F G R E T V L E Y L V S F G V W I R T P P A Y R

401 caccaaatgc ccctatctta tcaacacttc cggaactac tgttgttaga cgacgggacc gaggagggtc ccttagaaga agaactccct cgctcgcag  
 P P N A P I L S T L P E T T V V R R R D R G R S P R R R T P S P R

501 acgcagatct caatcgccgc gtcgcagaag atctcaatc cggaactc aatgtcttct ccttaagct gttacaact tcgtaccat gtaa  
 R R R S Q S P R R R R S Q S R E S Q C L L L K A V Y N F A T M -

Fig. 2



**Fig 3**

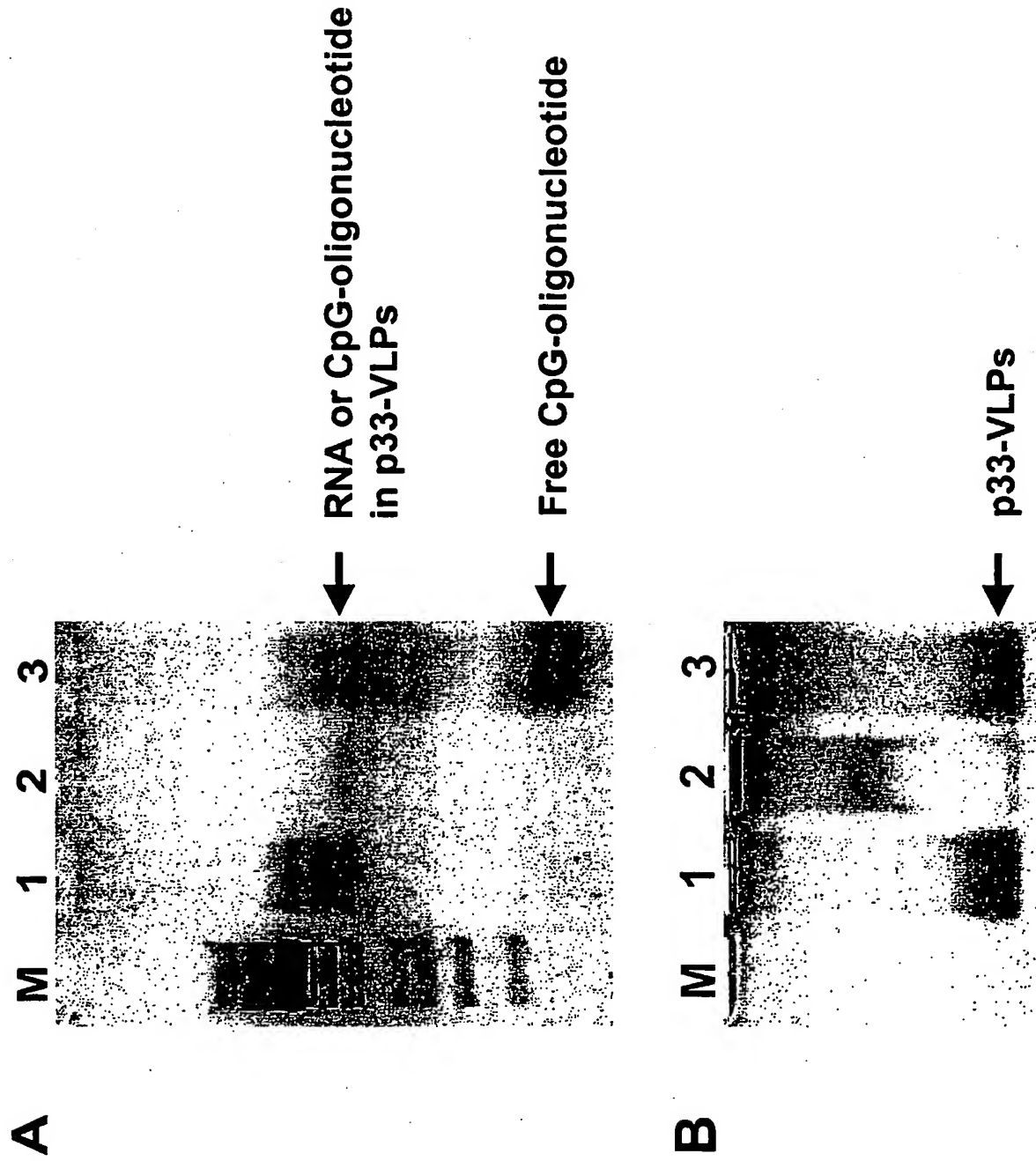
**Fig 4**



Fig 5

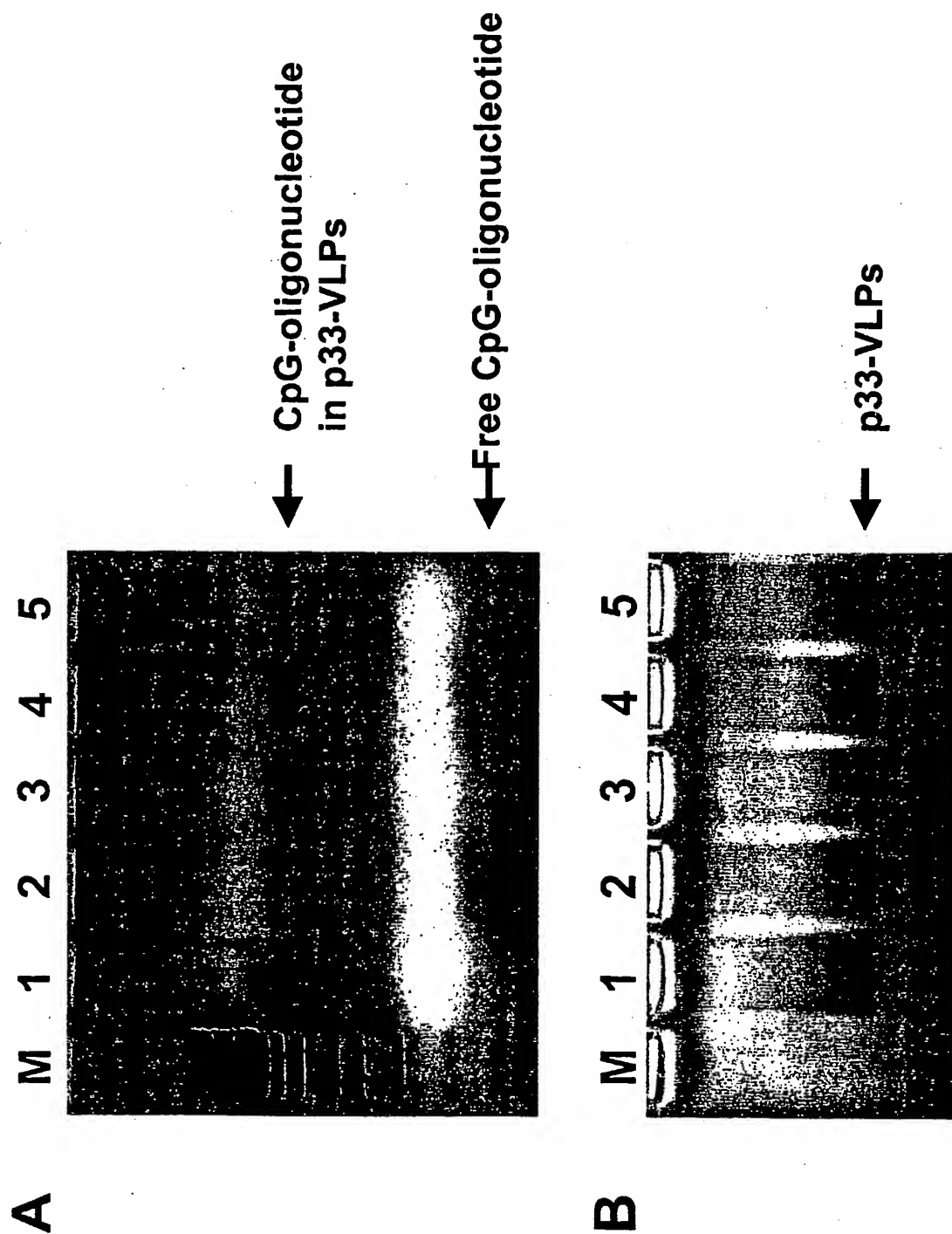
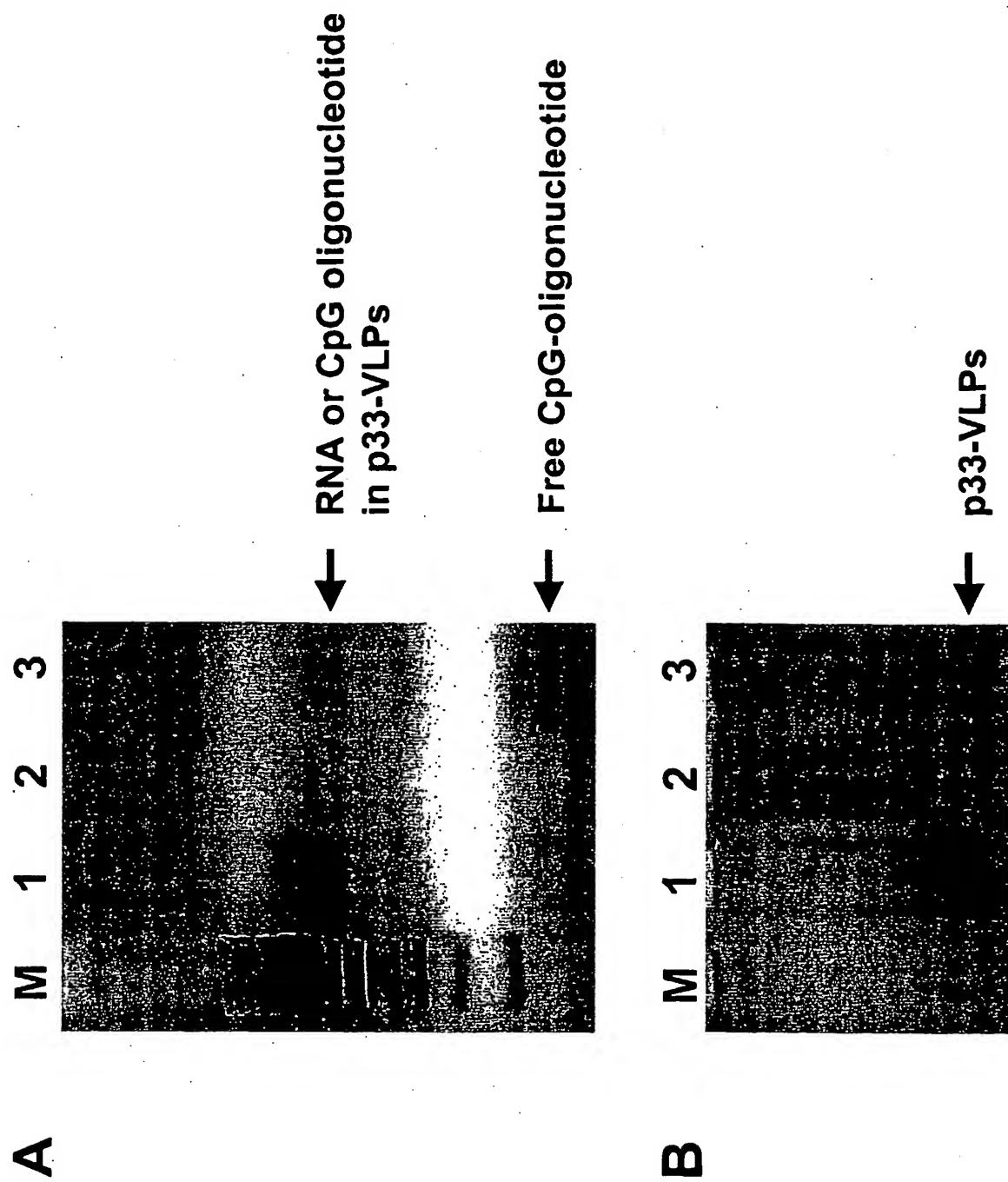


Fig 6





# Fig 7

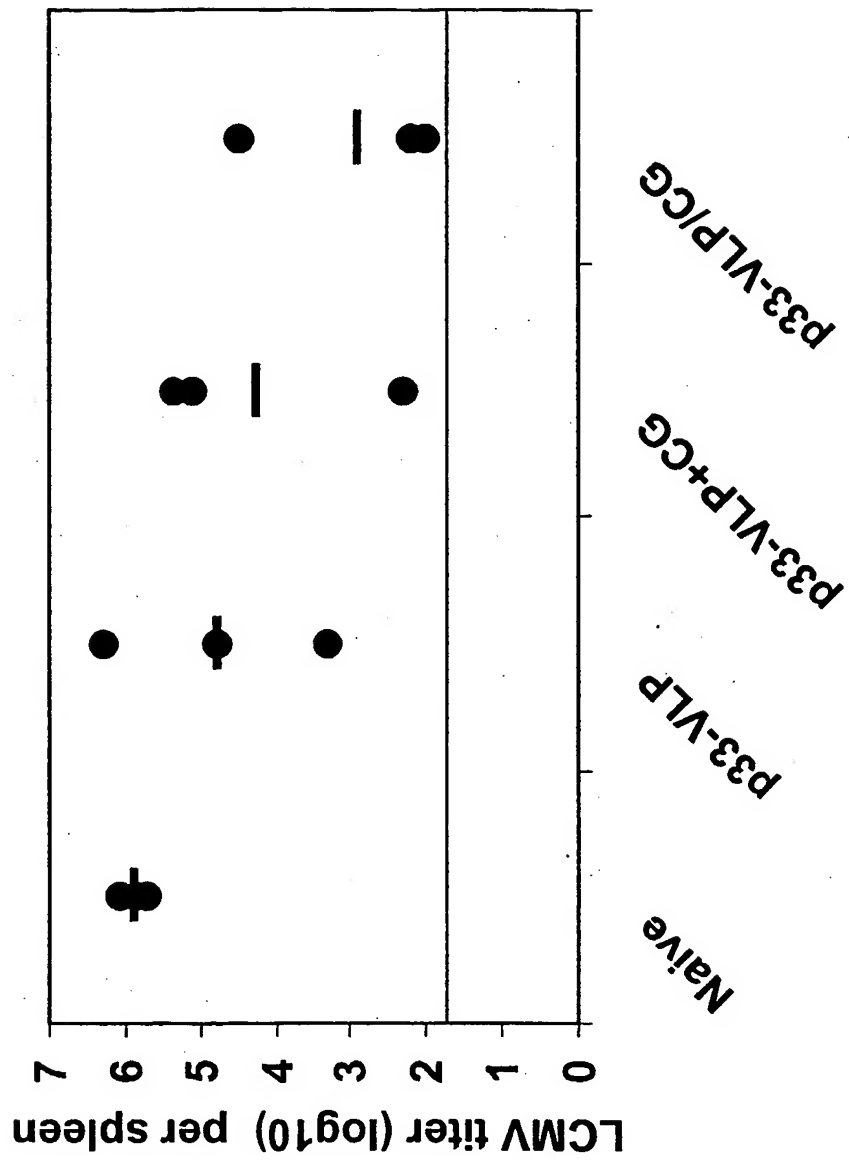


Fig 8

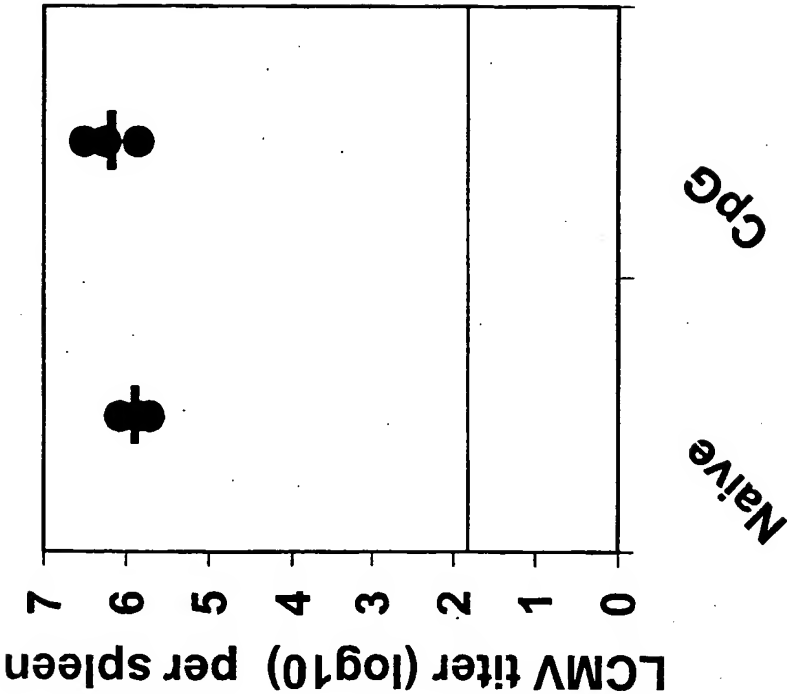


Fig 9

Fig. 10  
amino acid sequence of the BKV AS VP1 protein (GI:332779)

MAPTKRKGECPGAAPKKPEPVQVPKLLIKGGVEVLEVKTGVDAIT  
EVECFLNPEMGDPDDNLRGYSQHLSAENAFESDSPDRKMLPCYSTA  
RIPLPNLNEDLTCGNLLMWEAVTVKTEVIGITSMNLNLHAGSQKVHE  
NCGGKPVQGSNFHFFAVGGDPLEMQGVLNMNYRTKYPQGTTTPKNPT  
AQSQVMNTDHKAYLDKNNAYPVECWIPDPSRNENTRYFGTYTGGEN  
VPPVLHVTNTATTVLLDEQGVGPLCKADSLYVSAADICGLFTNSSG  
TQQWRGLARYFKIRLRKRSVKNPYPI SFLLSDLINRRTQKVDGQPM  
YGMESQVEEVRFVDGTEQLPGDPPDMIRYIDRQGQLQTKMV

Fig. 11  
nucleic acid sequence of the 246 bp DNA fragment

```
1  GCGGGTGGTG TCAGATCTAC AATGATCGTC ATCACCTTGG TGATGCTGAA
51 GAAGAAACAG TACACATCCA TTCATCATGG TGTGGTGGAG GTTGACGCCG
101 CTGTCACCCC AGAGGAGCGC CACCTGTCCA AGATGCAGCA GAACGGCTAC
151 GAAAATCCAA CCTACAAGTT CTTTGAGCAG ATGCAGAACG CTAGCTATCC
201 ATACGATGTC CCTGATTACG CCTAACGCCG ATTGCCCAGC ACAGTG
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Fig. 12

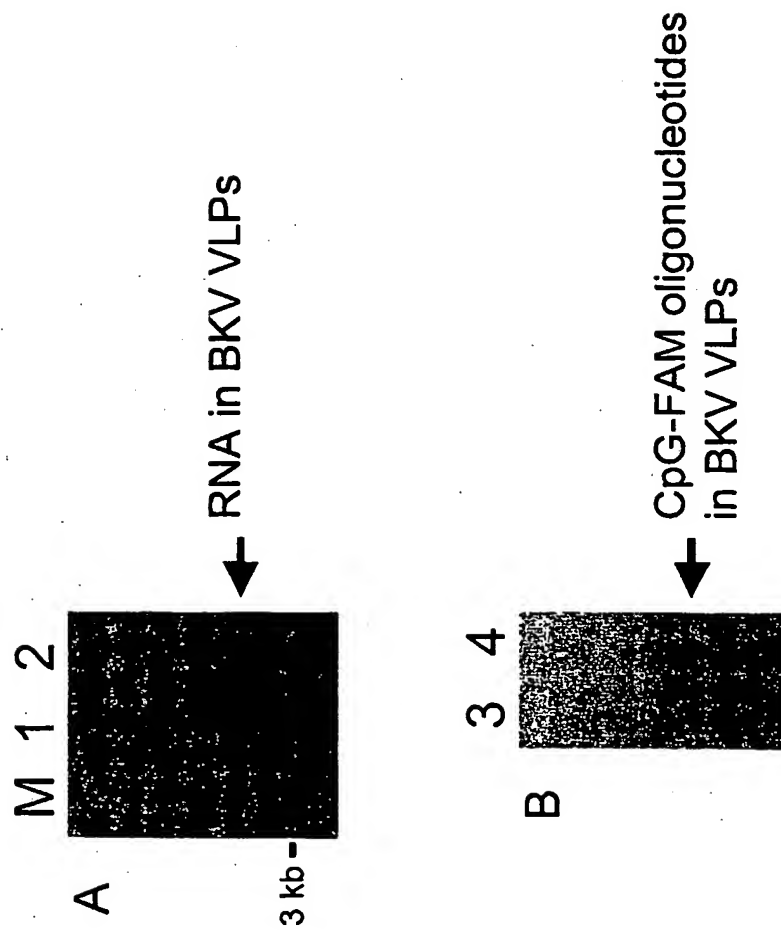
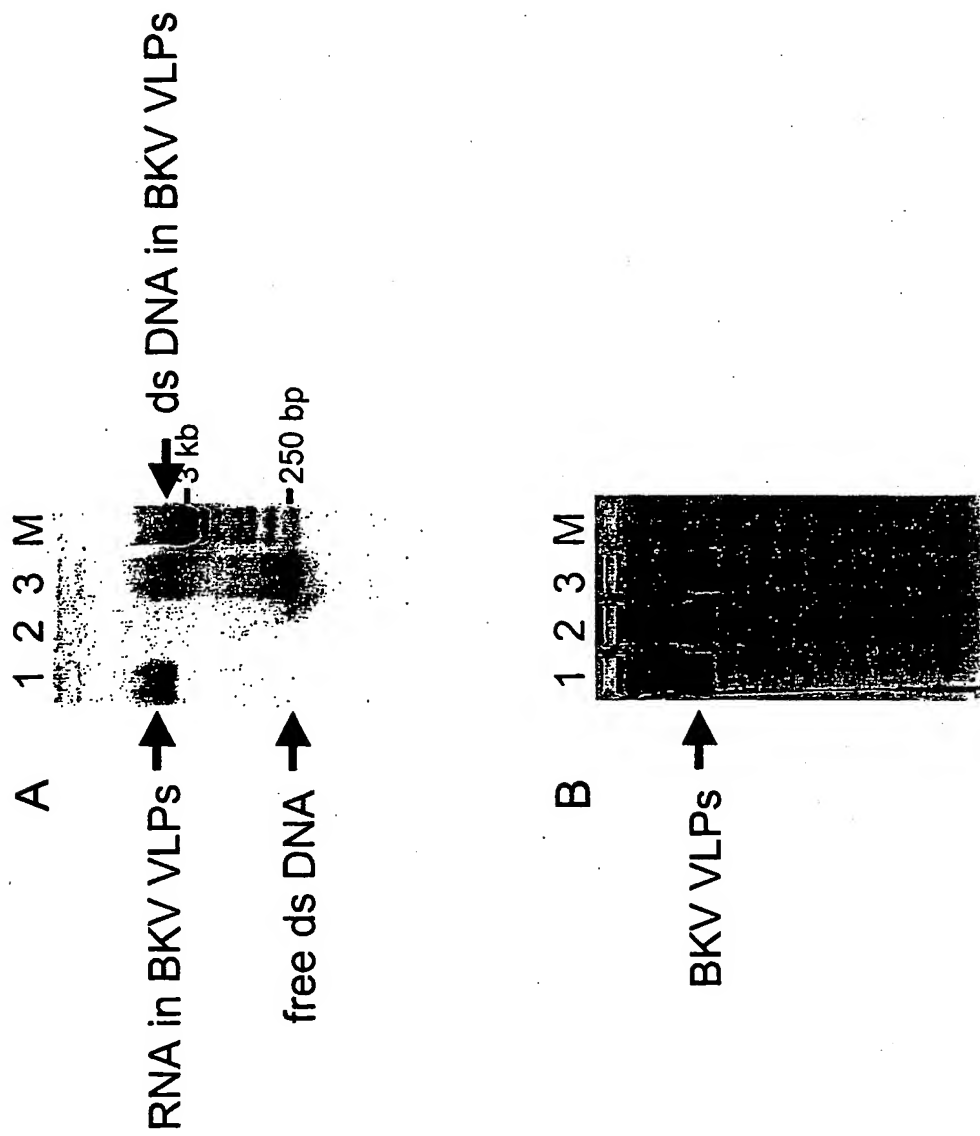




Fig. 13



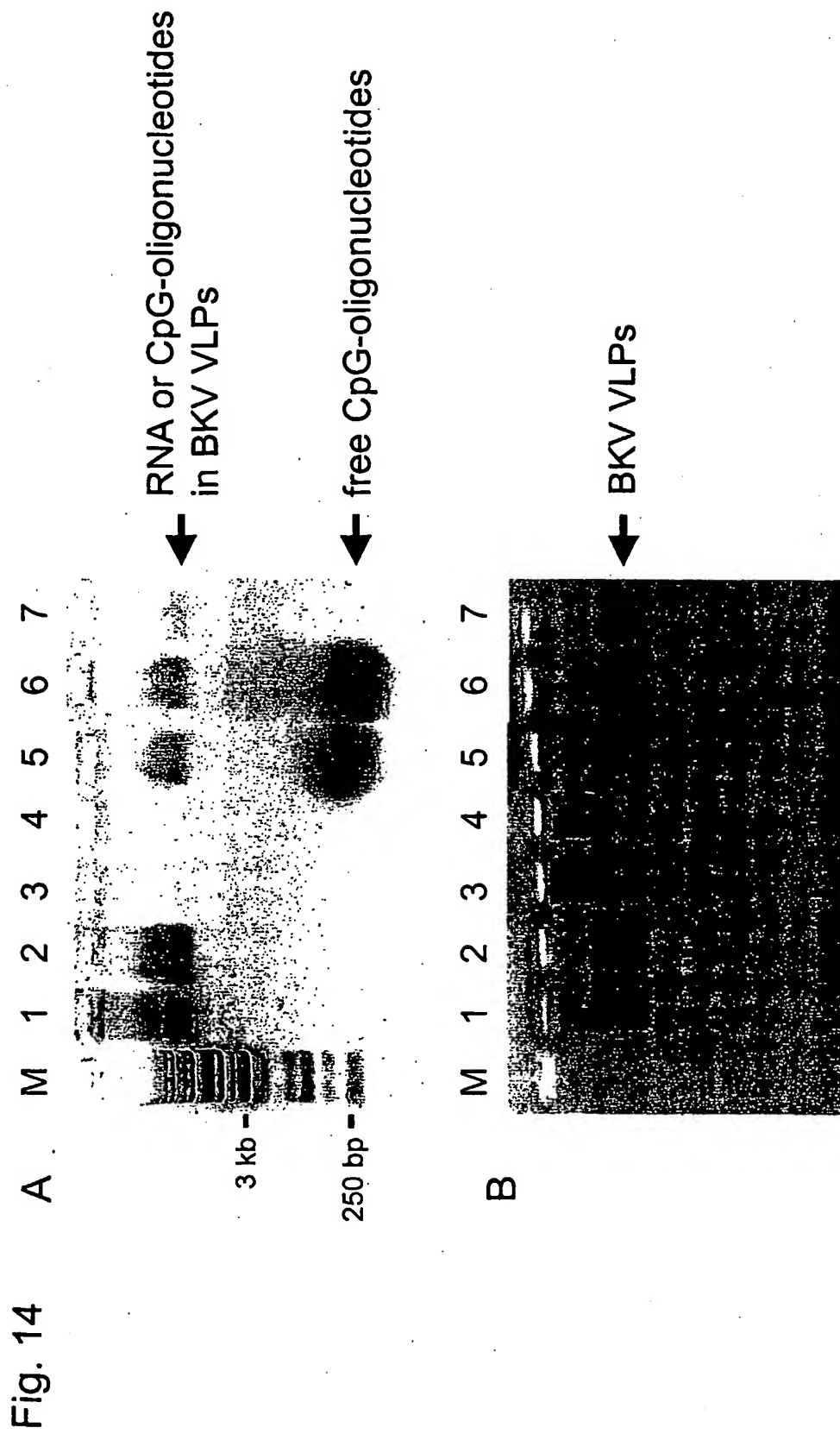
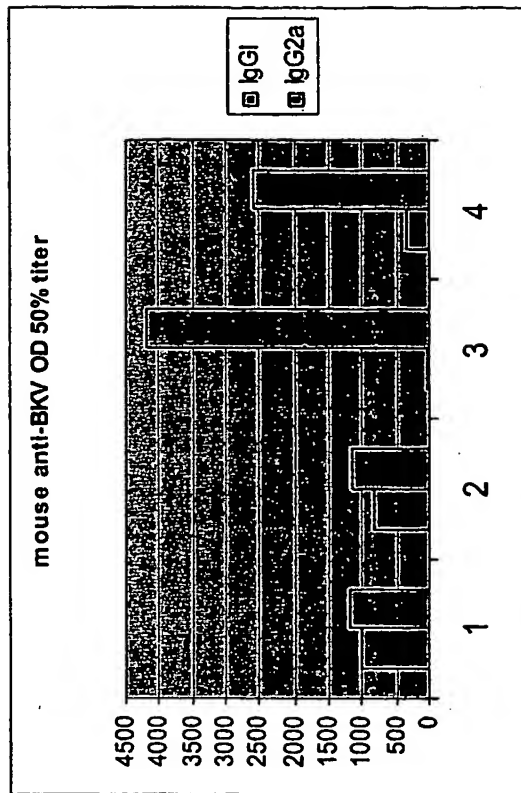
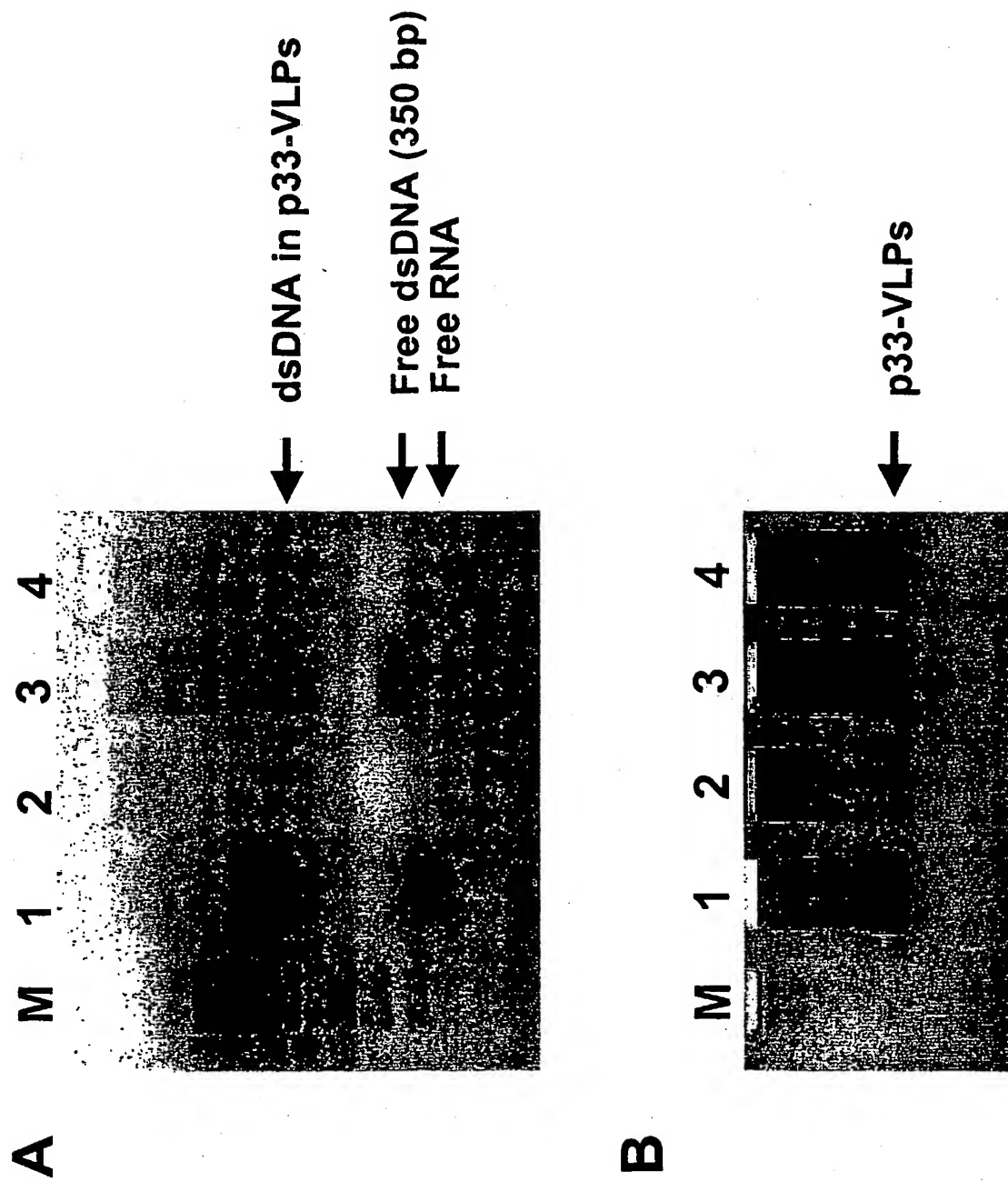


Fig. 15



OD 50% titer	BKV	BKV plus 0.3 nmol CpG(pt)	BKV plus 20 nmol CpG(pt)	BKV / 0.3 nmol CpG(pt)
IgG1	1015	823	<40	340
Stdev	470	412	0	241
IgG2a	1190	1142	4193	2596
Stdev	406	1219	1137	1232

Fig. 16



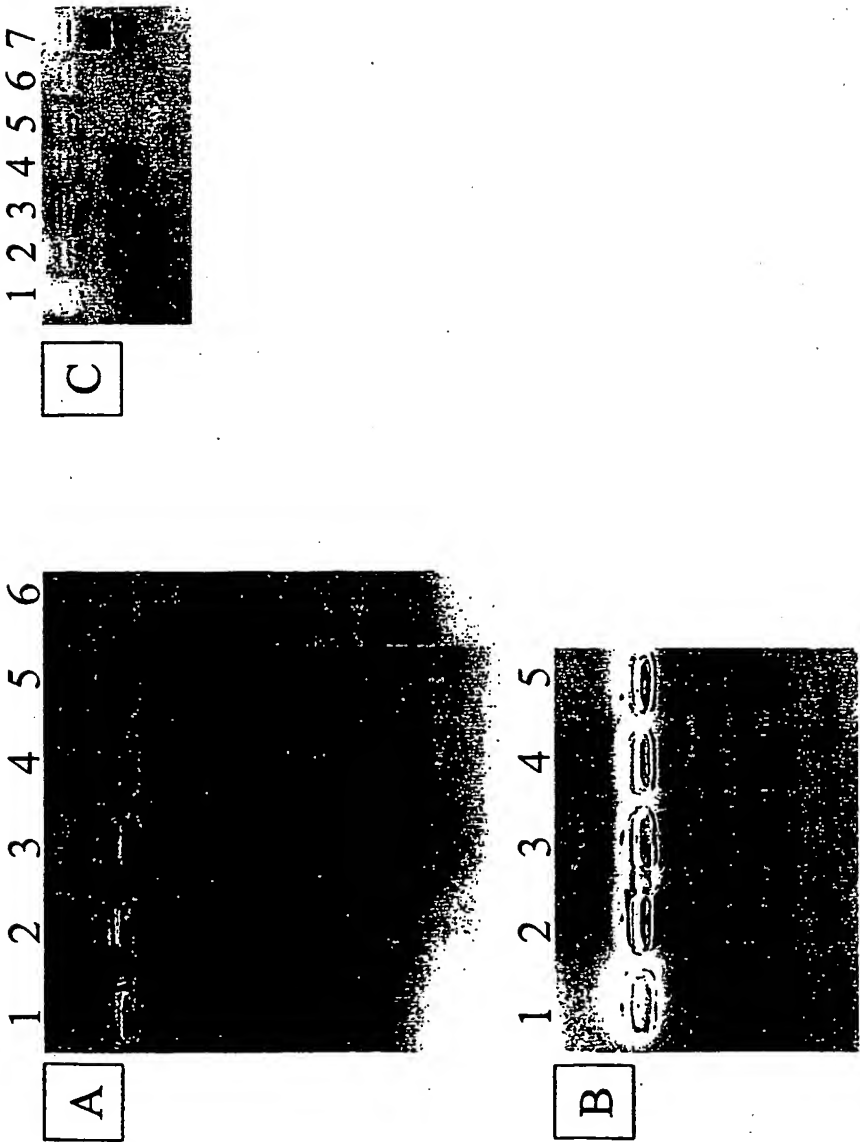


FIG. 17

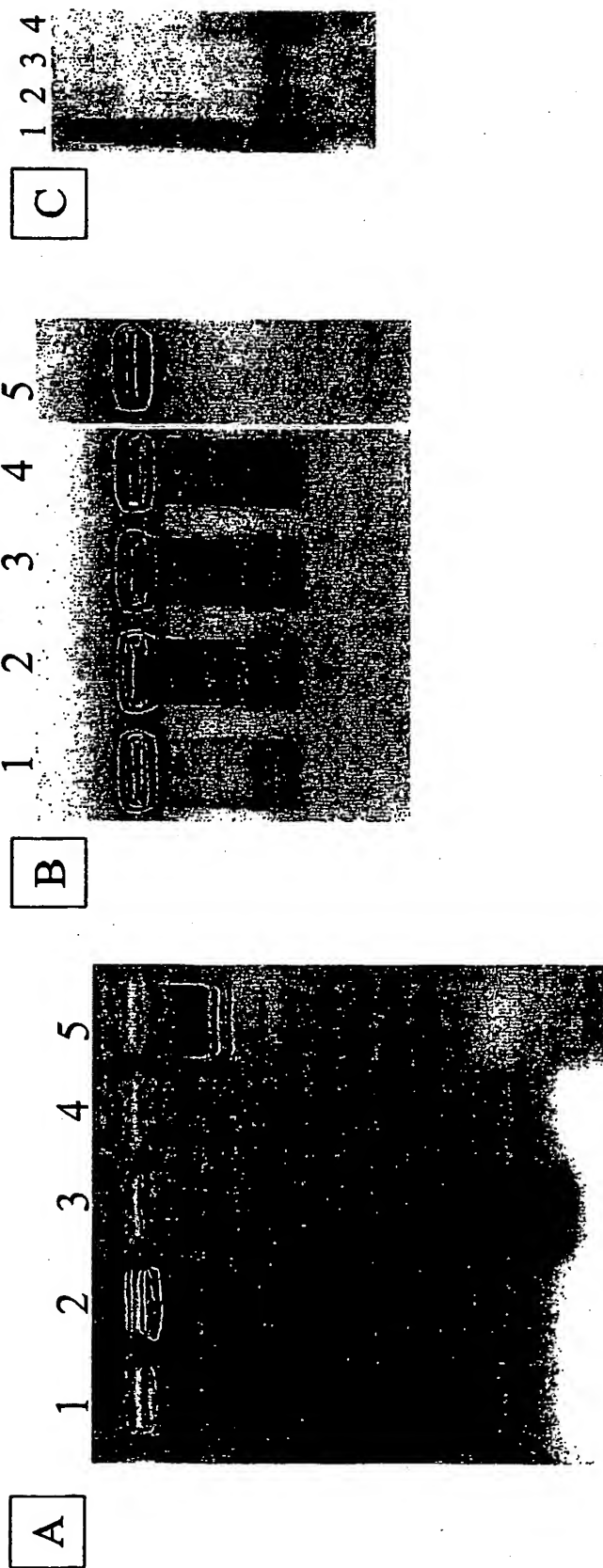


FIG. 18

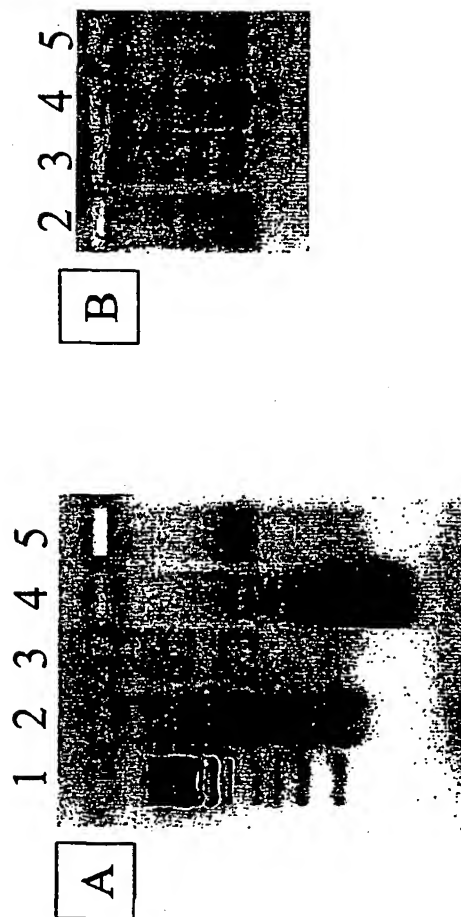


FIG. 19

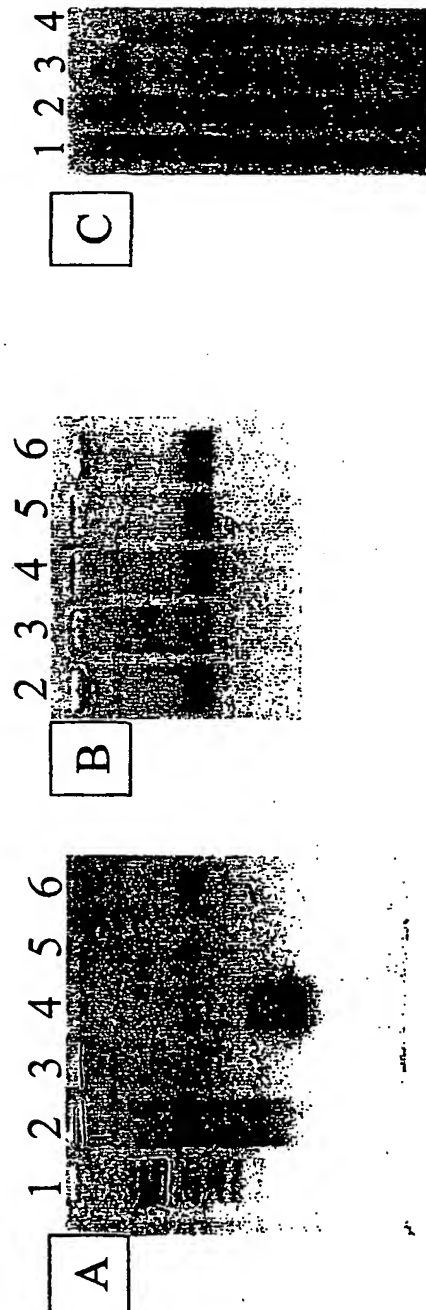


FIG. 20



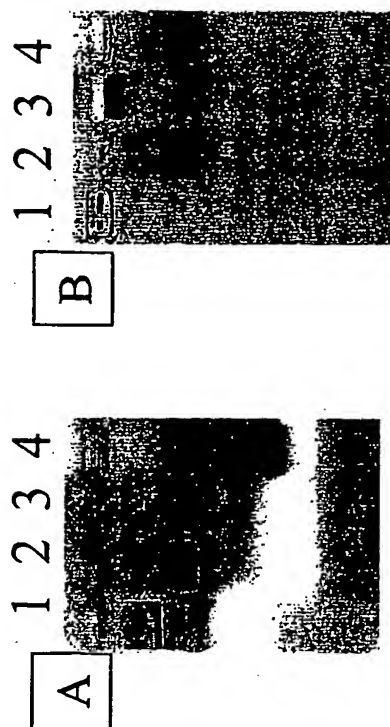


FIG. 21

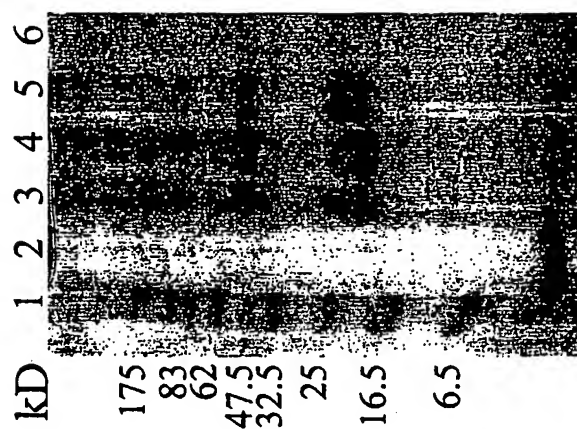


FIG. 22

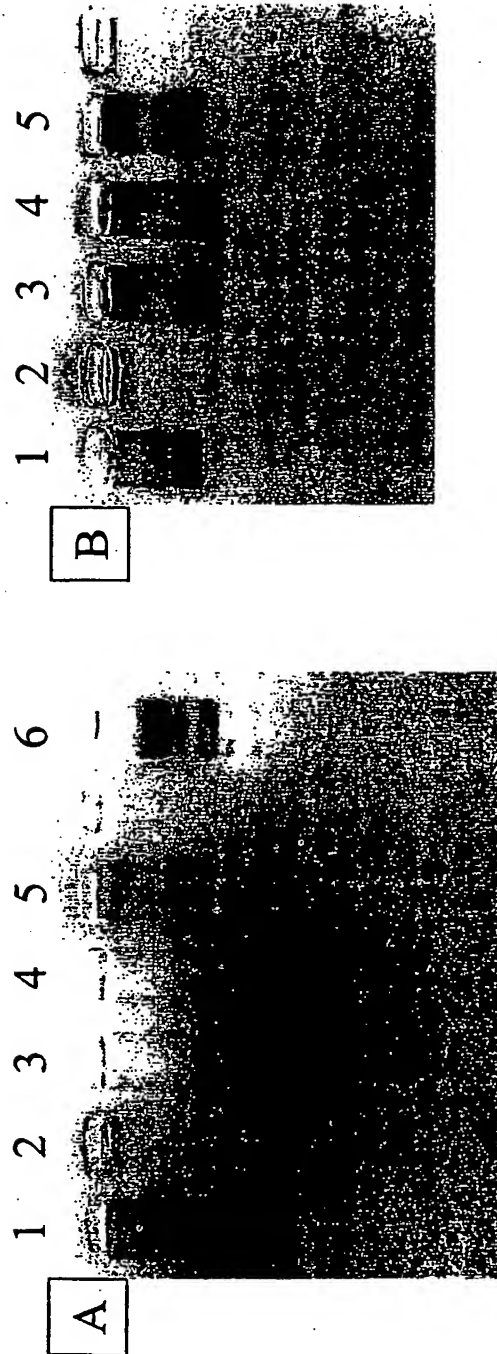


FIG. 23

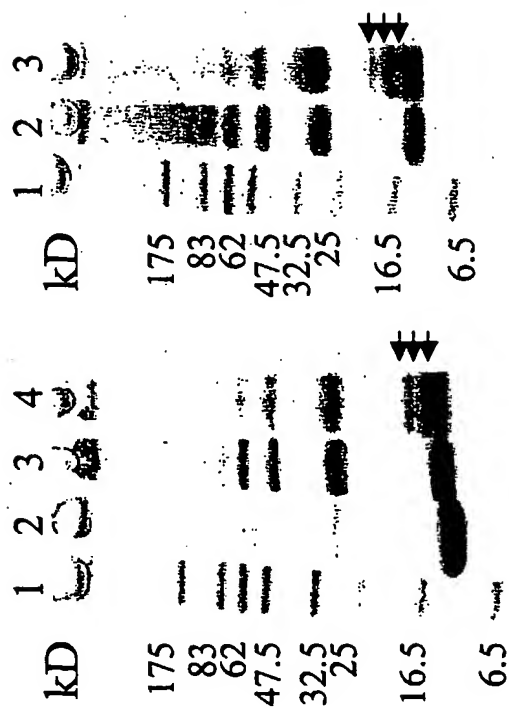


FIG. 24

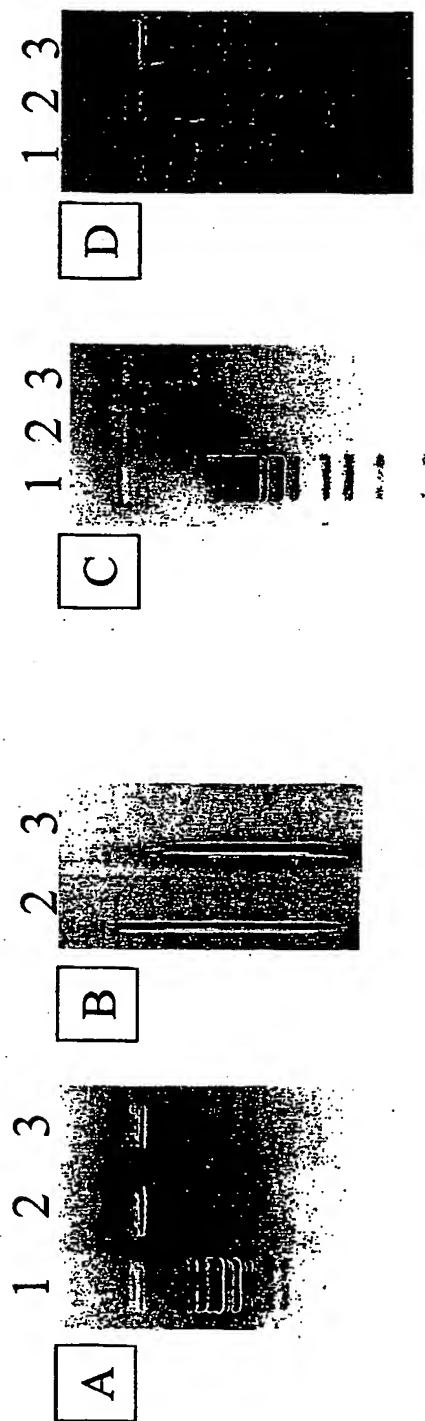


FIG. 25

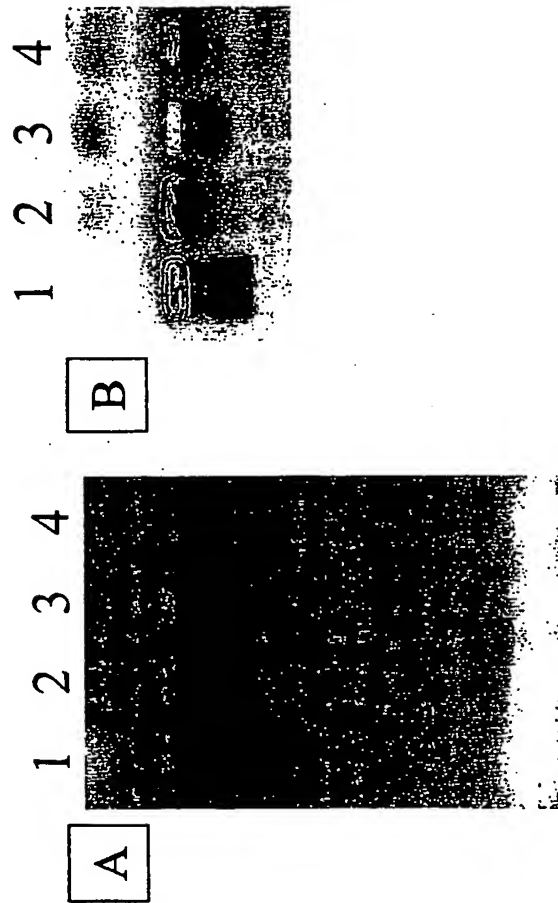


FIG. 26

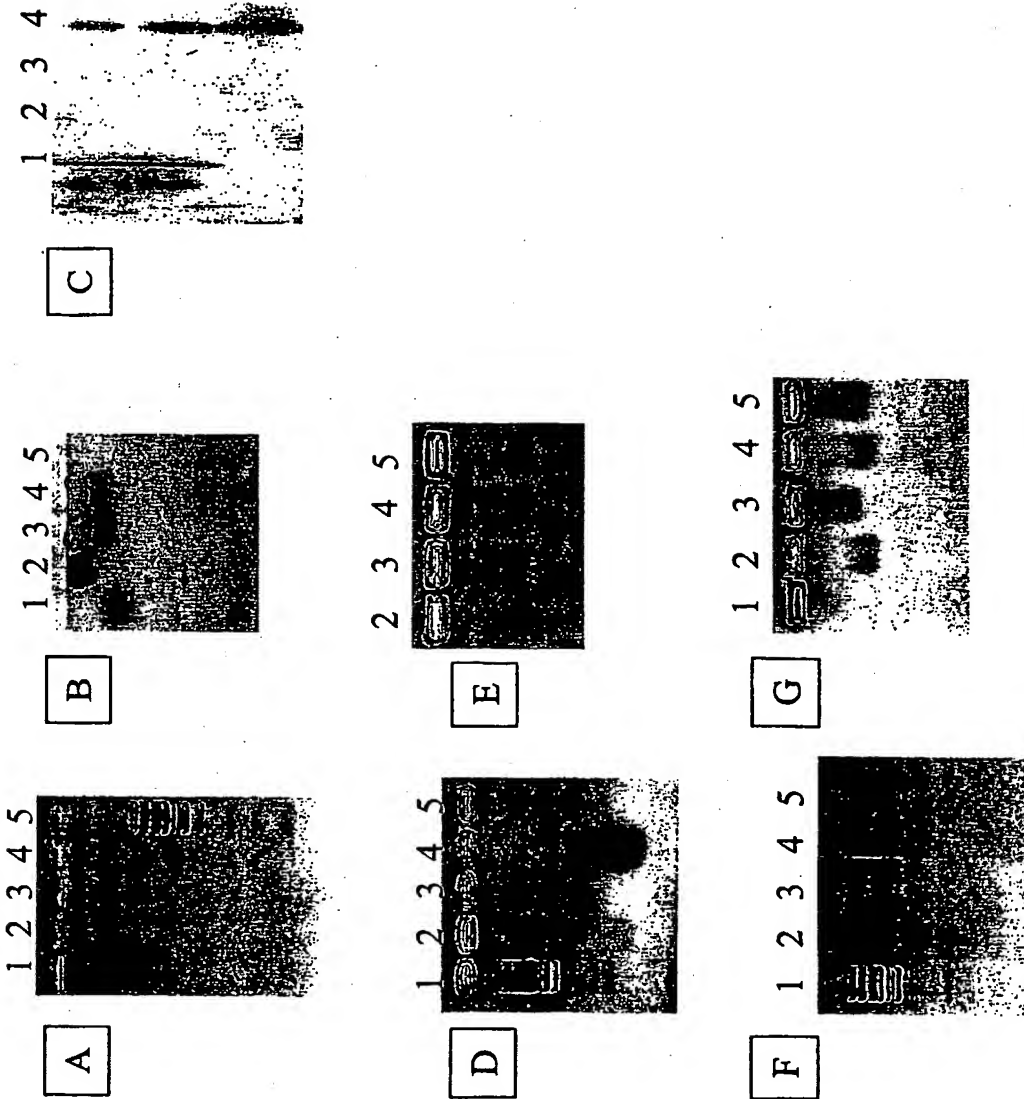
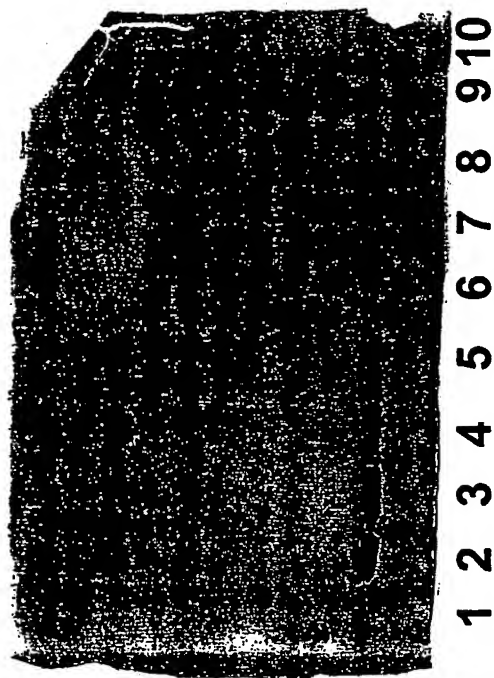
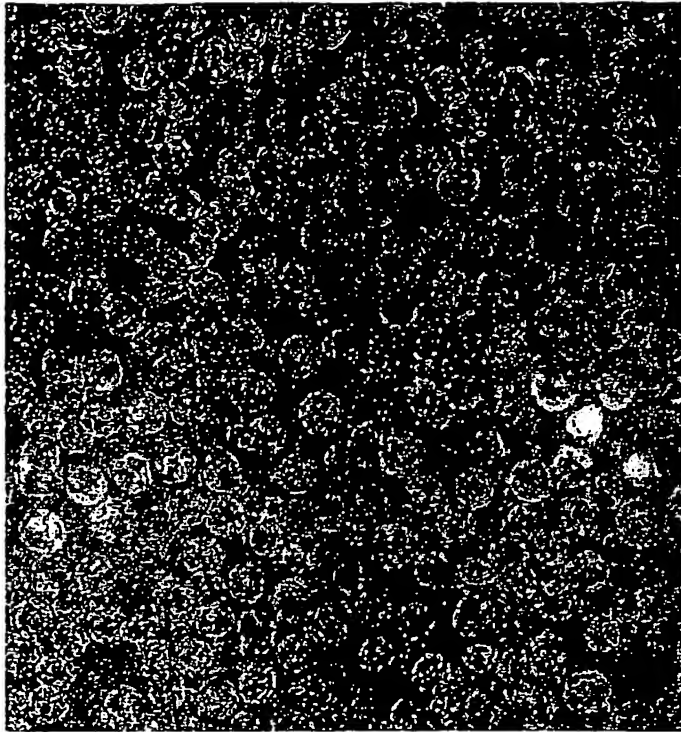


FIG. 27

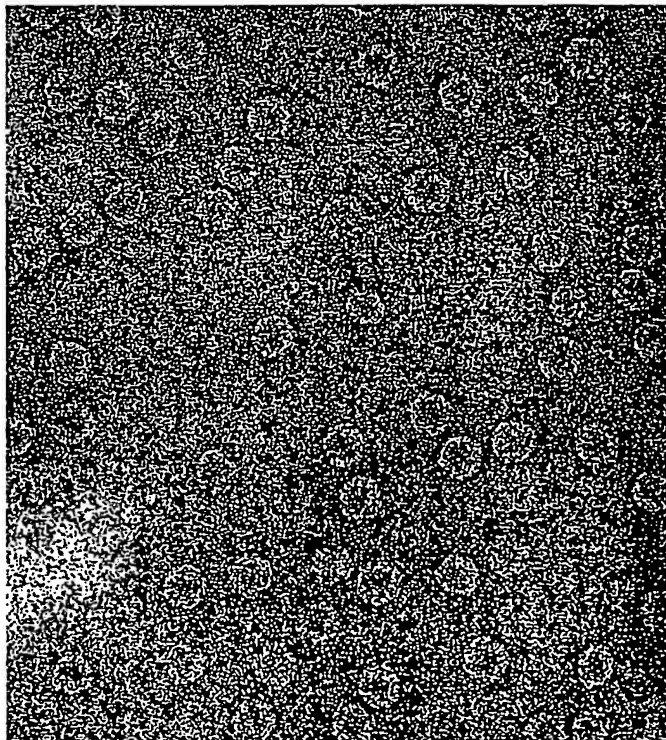


**FIG. 28**



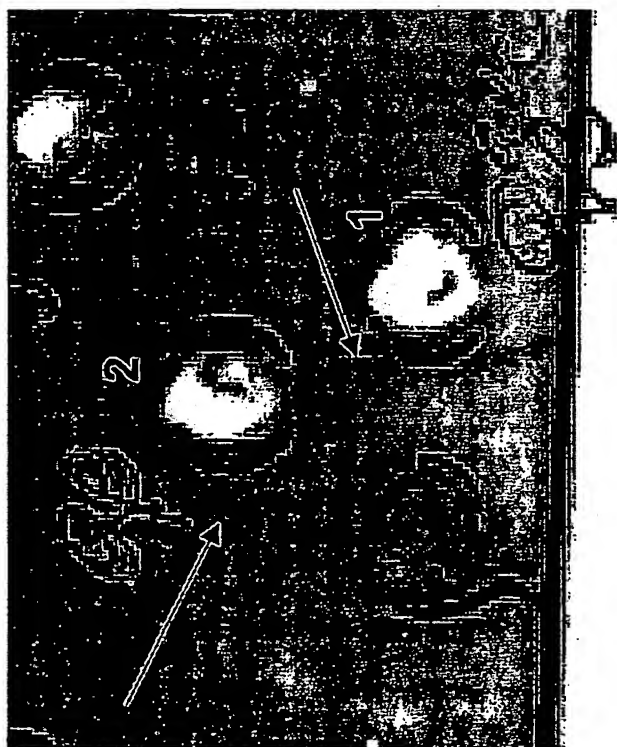


**B**



**A**

**FIG. 29**

**Fig. 30 A**

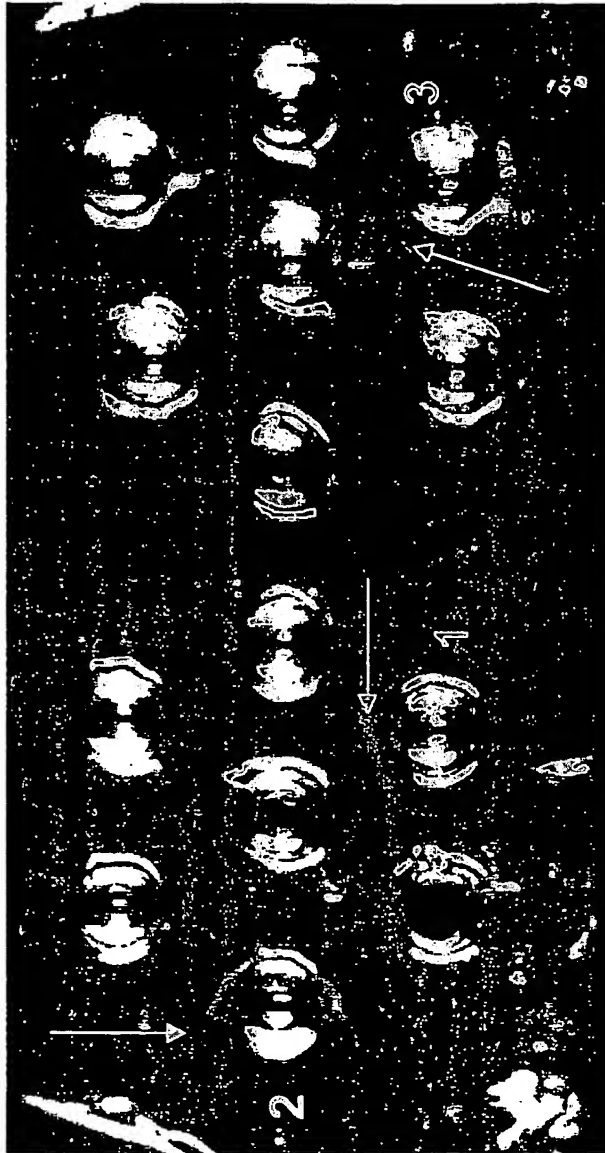


Fig. 30 B

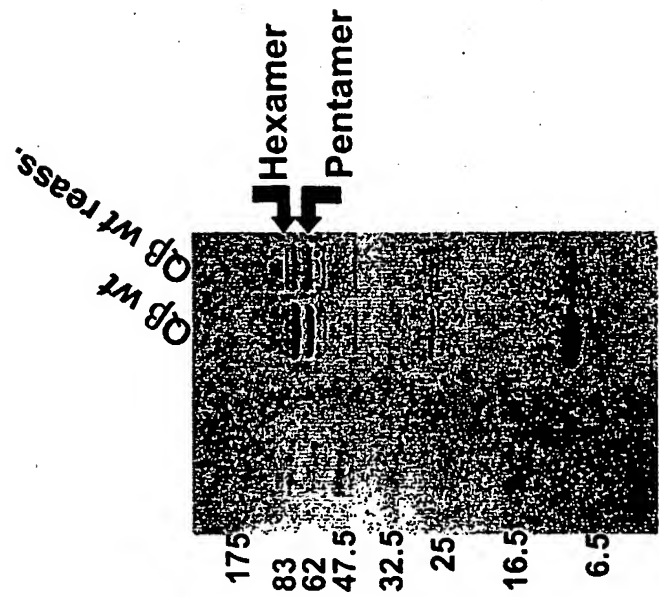
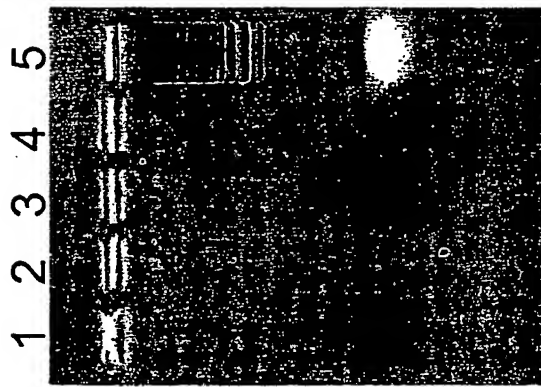


Fig. 31 A



**Fig. 31 B**

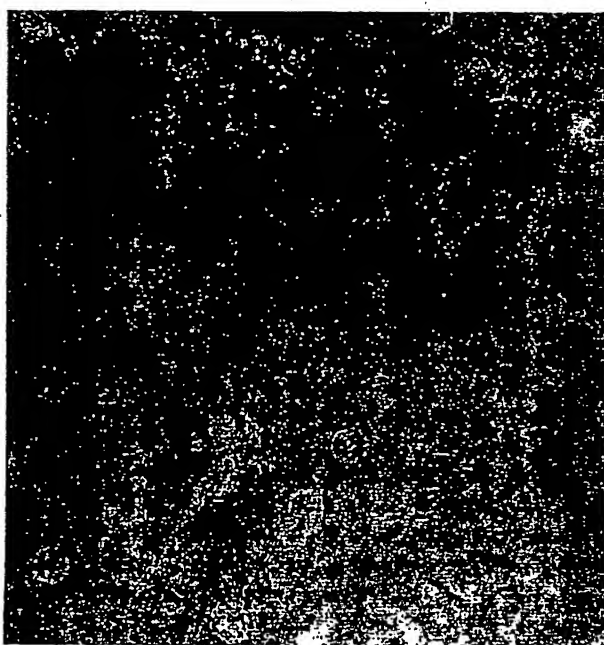
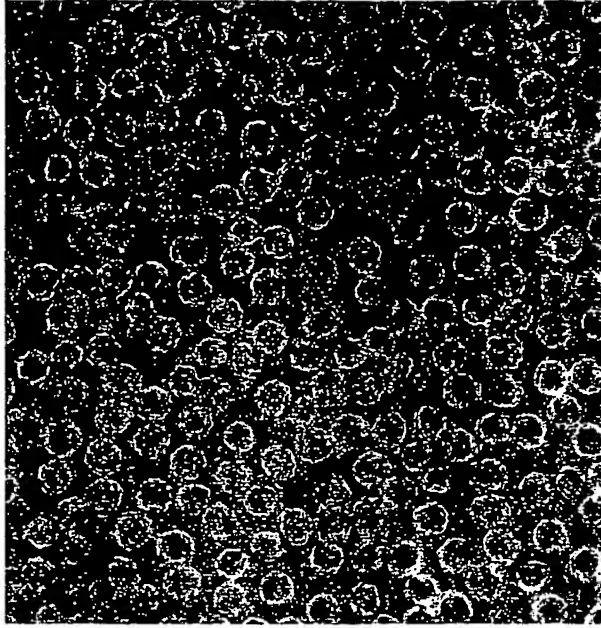
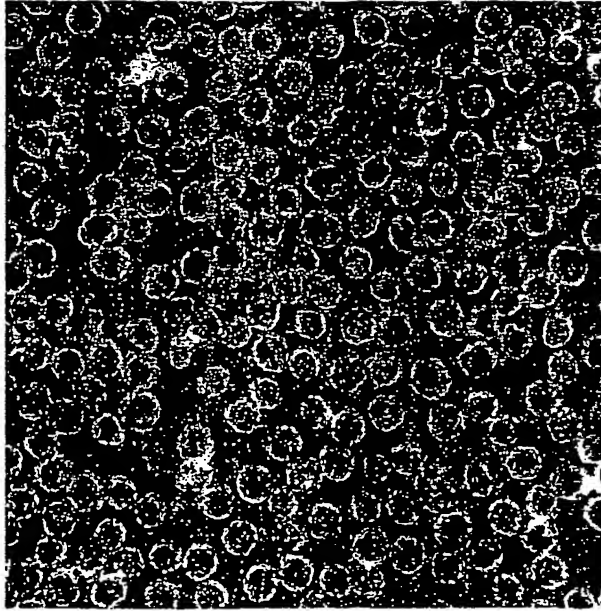


Fig. 32

**B**

CyCyCy

**A**

Cy(CpG)20

Fig. 33

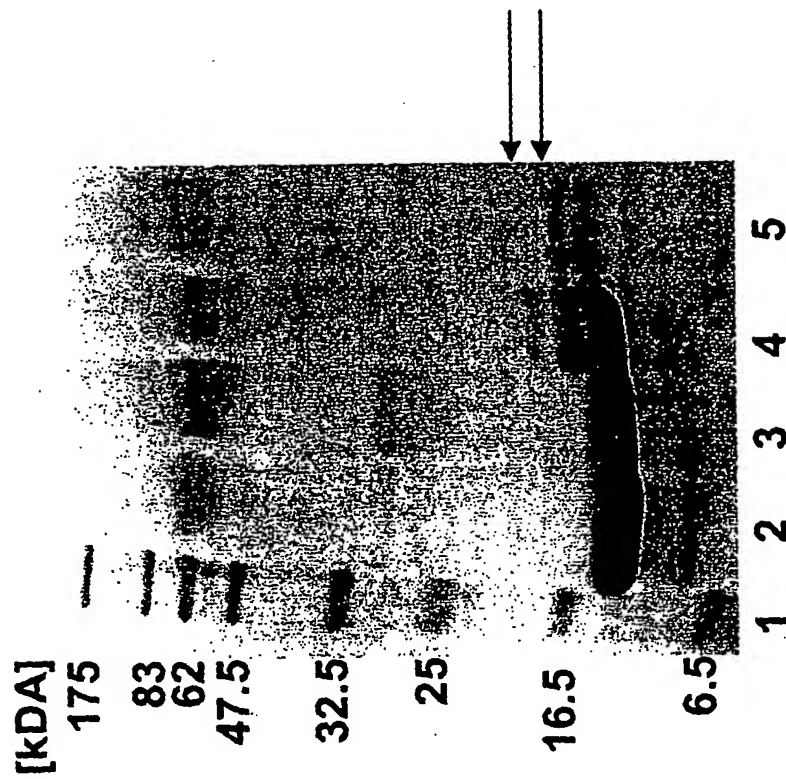


Fig. 34





Fig. 35

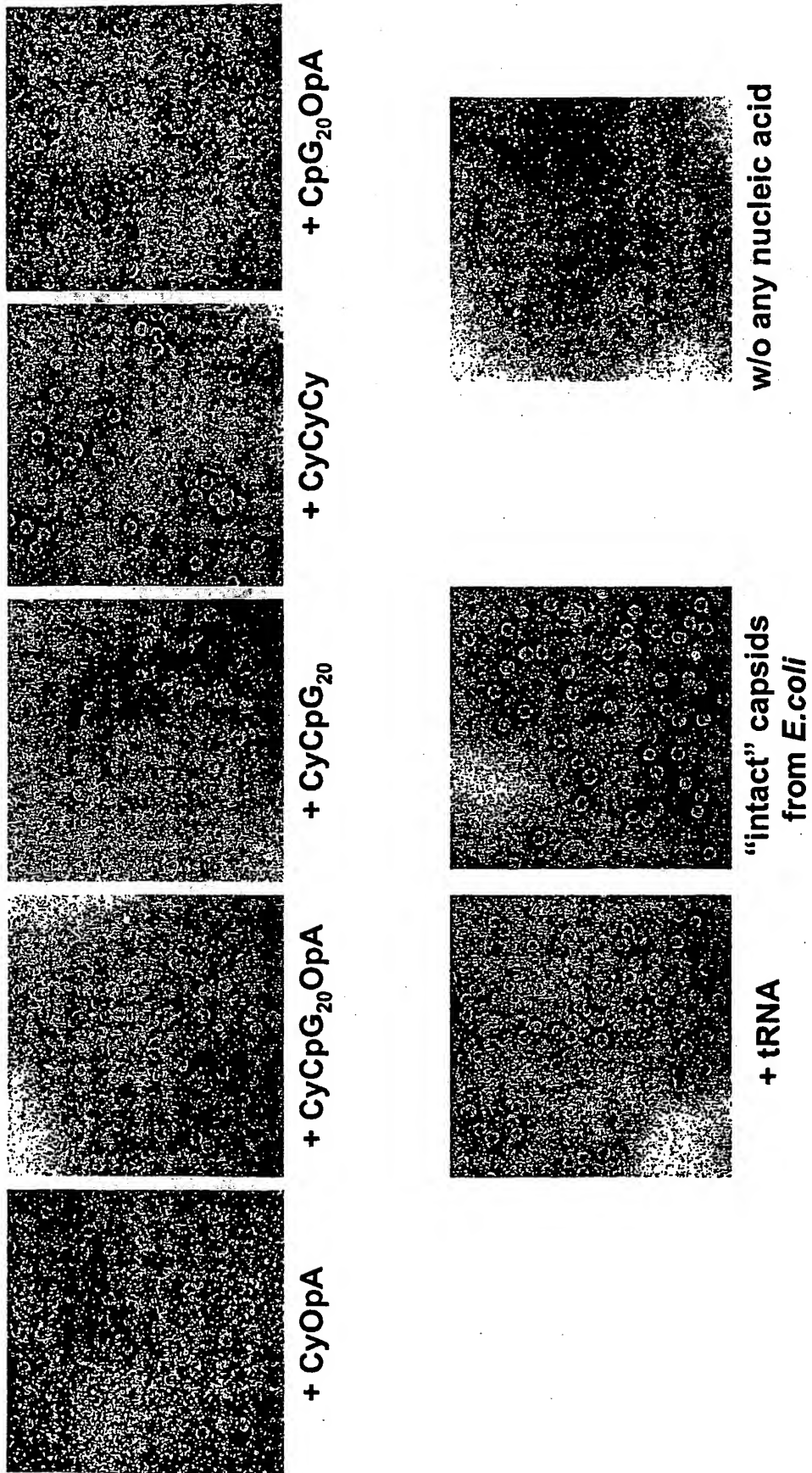


Fig. 36

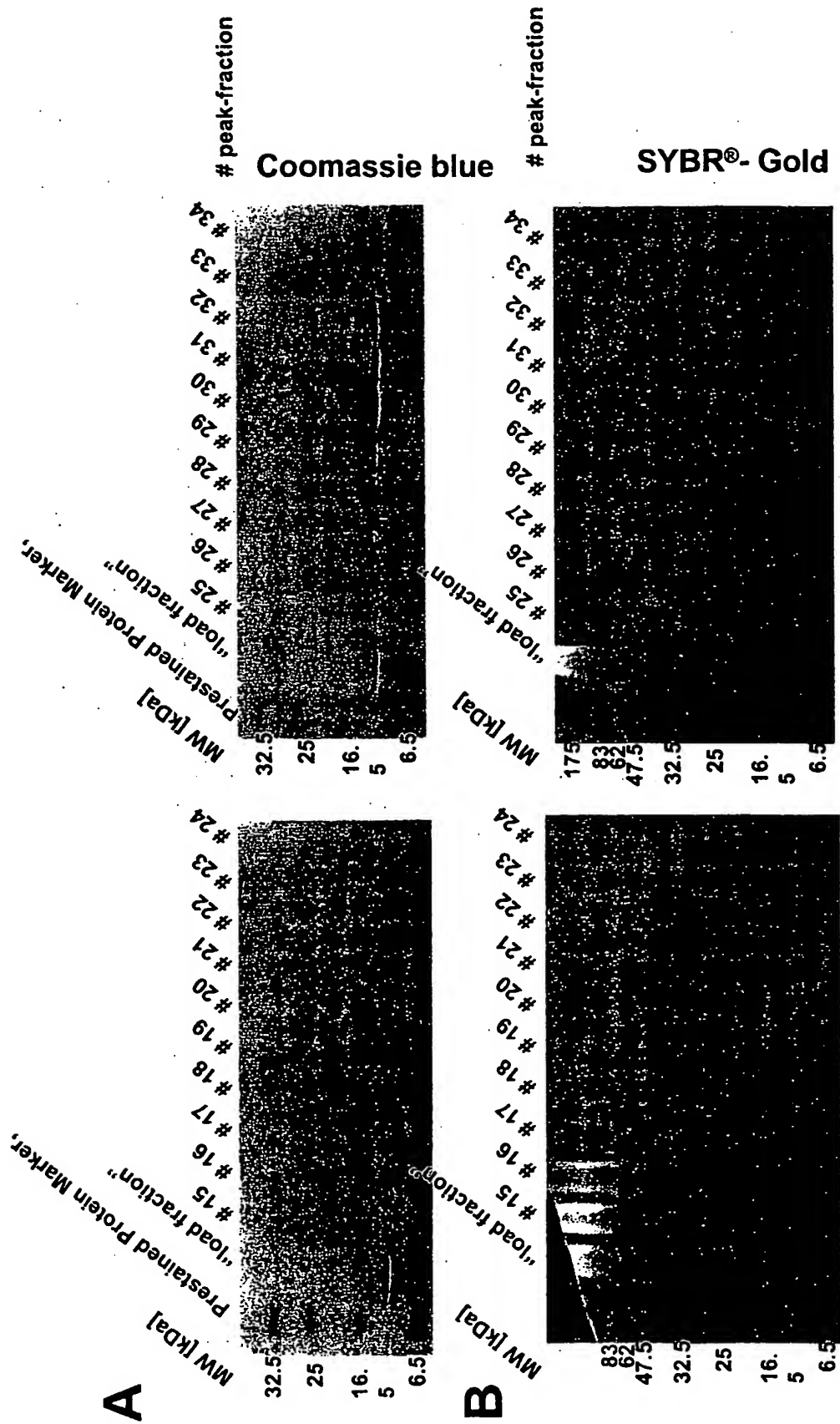
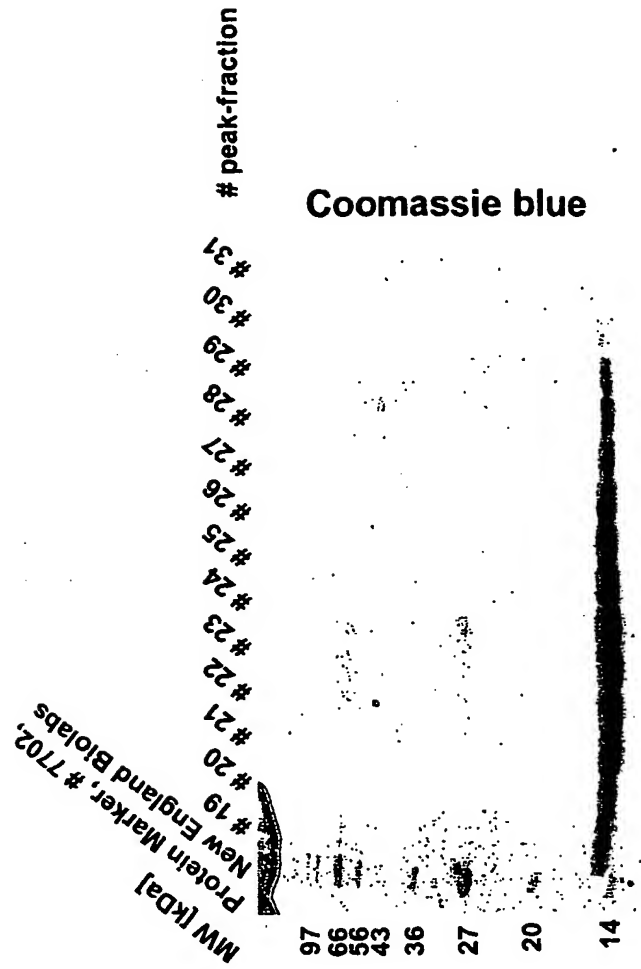


Fig. 37

**Fig. 38**

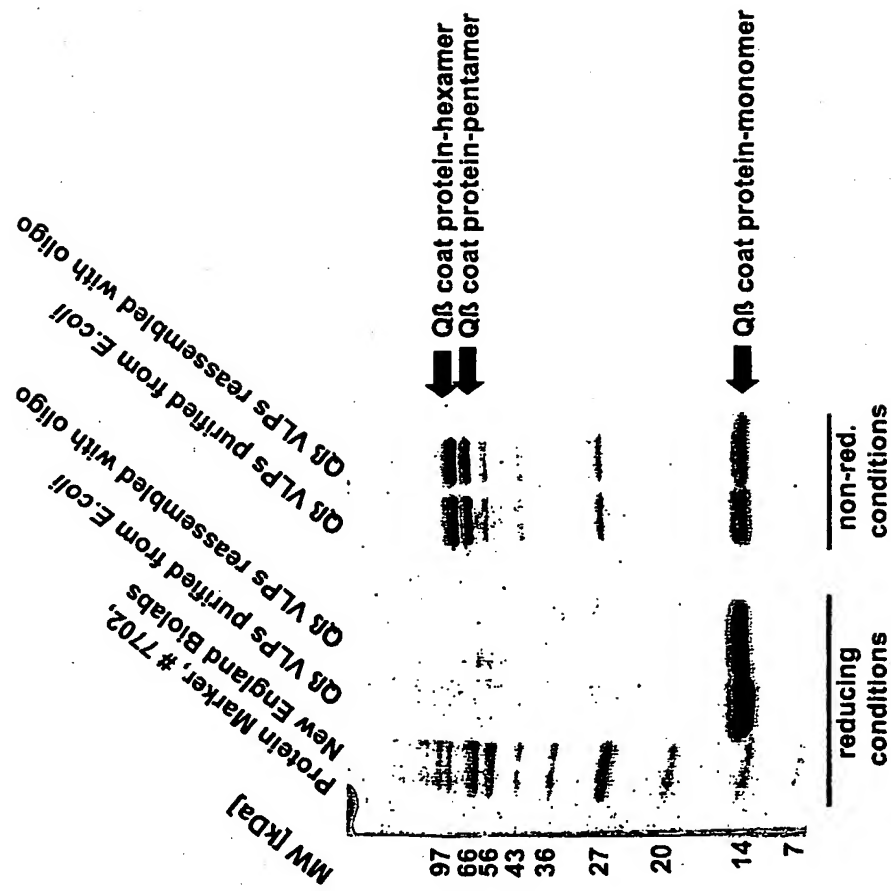


Fig. 39

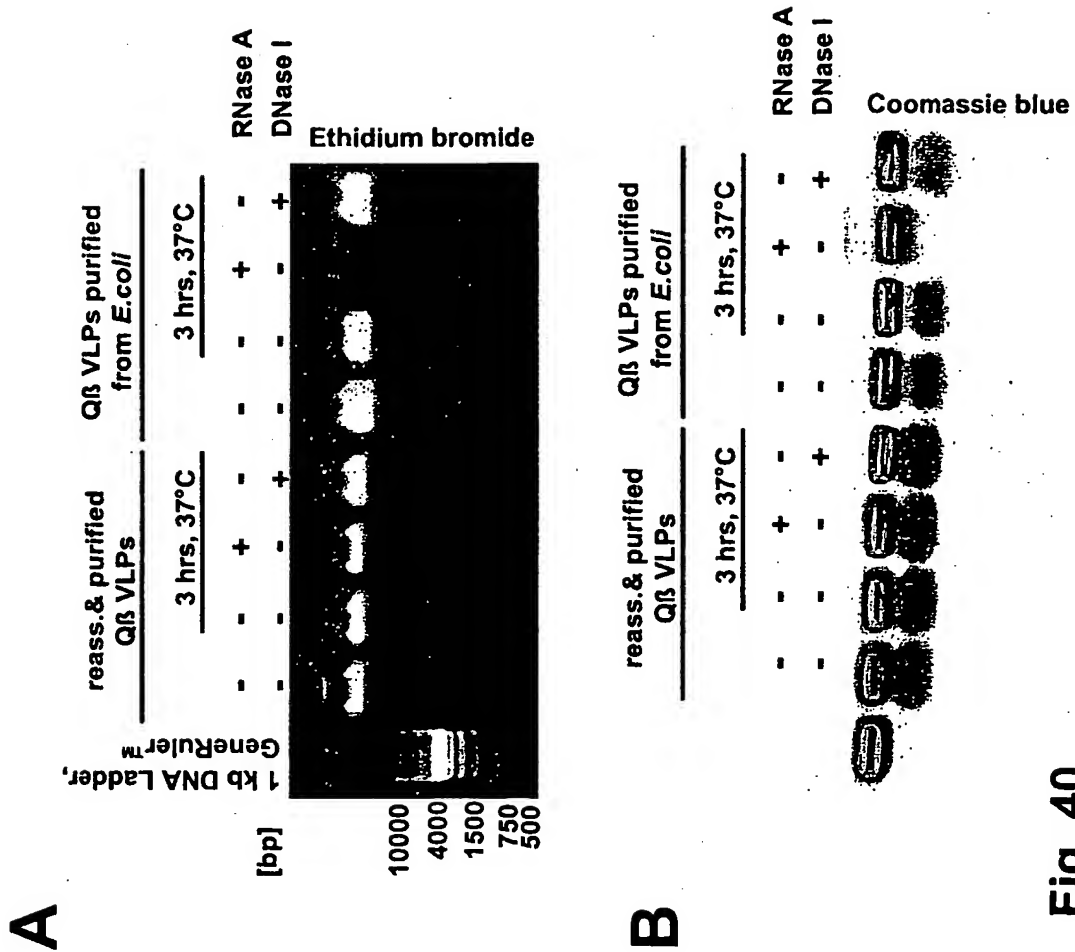
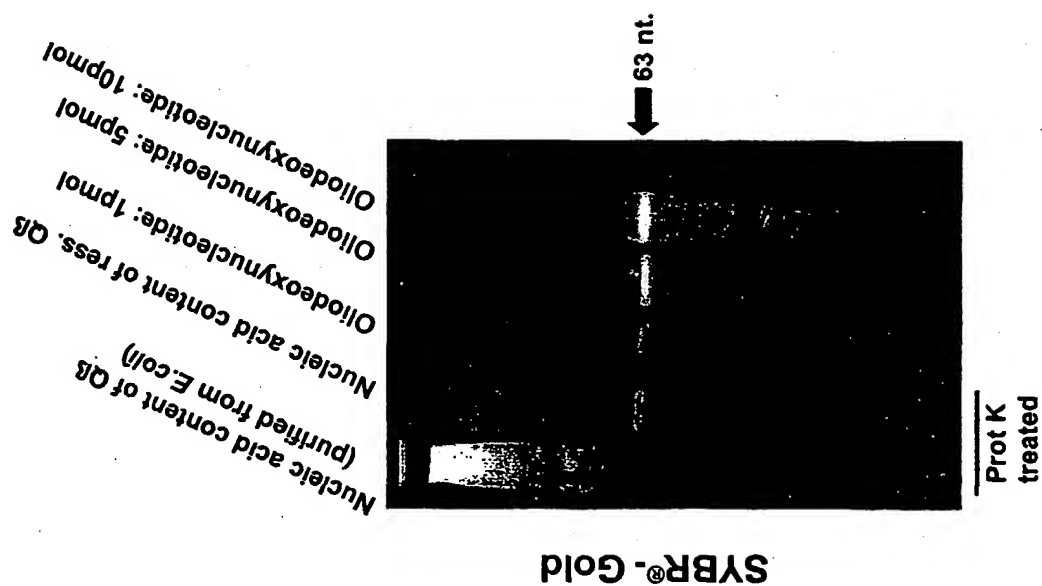
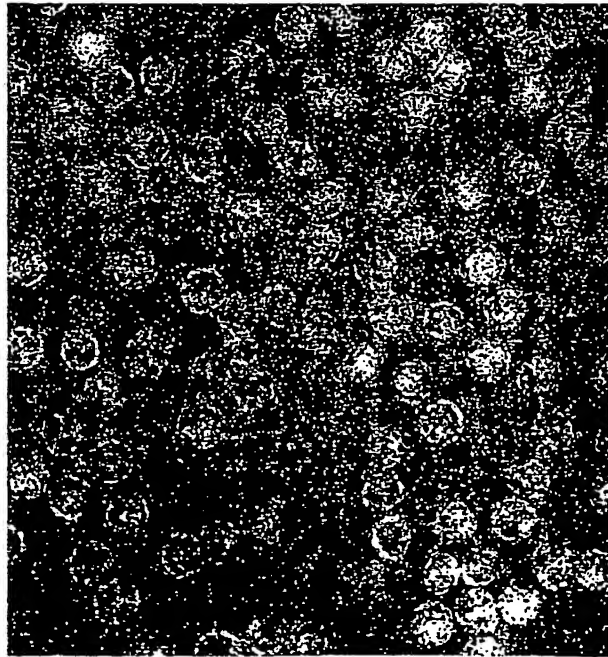


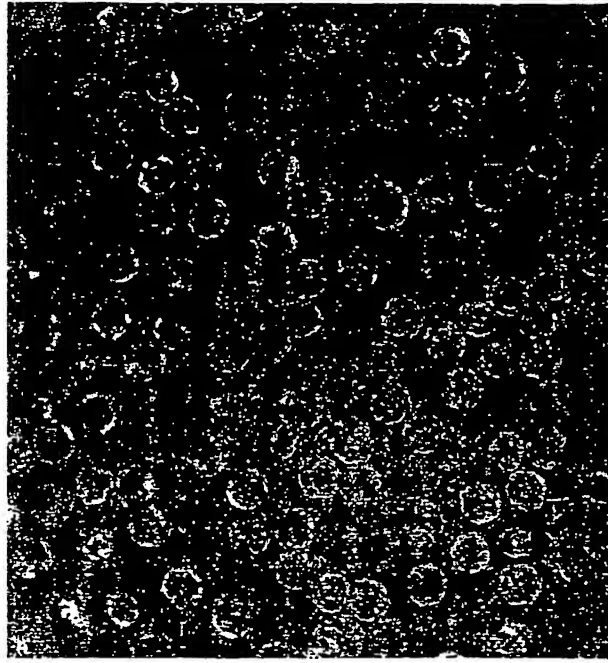
Fig. 40



**Fig. 41**

**A**

recombinant

**B**

reassembled

**Fig. 42**



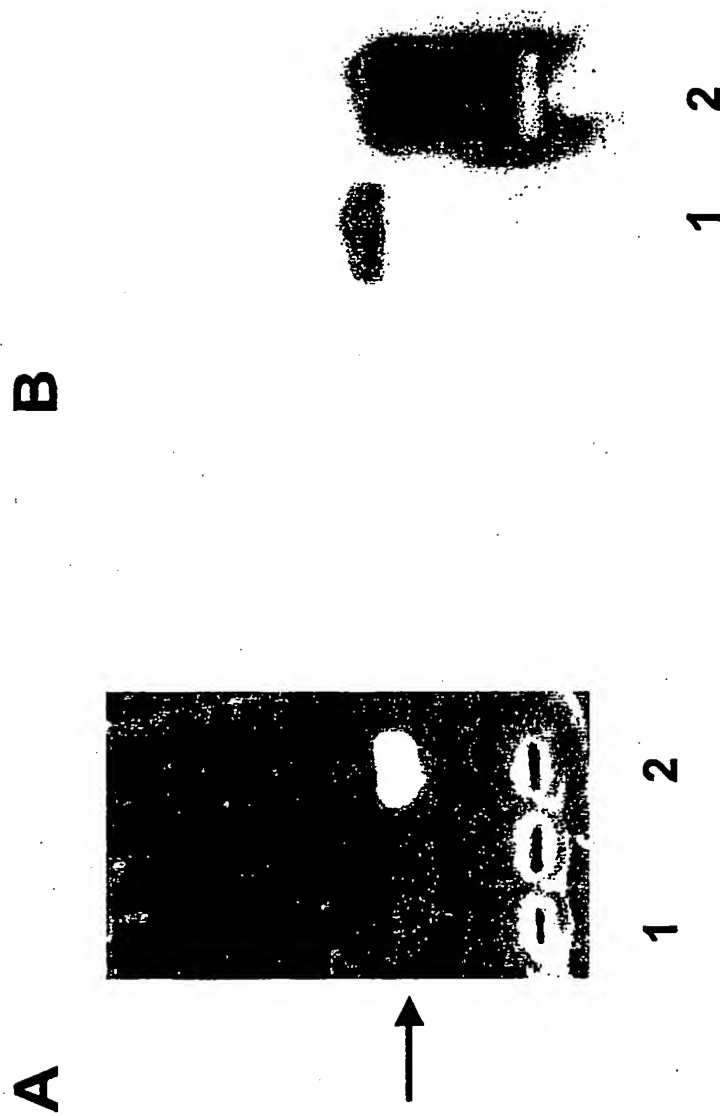
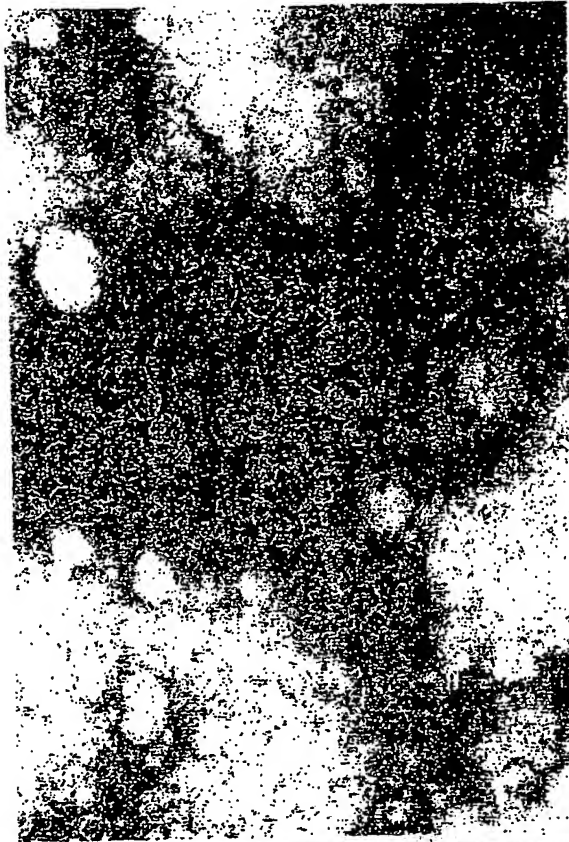
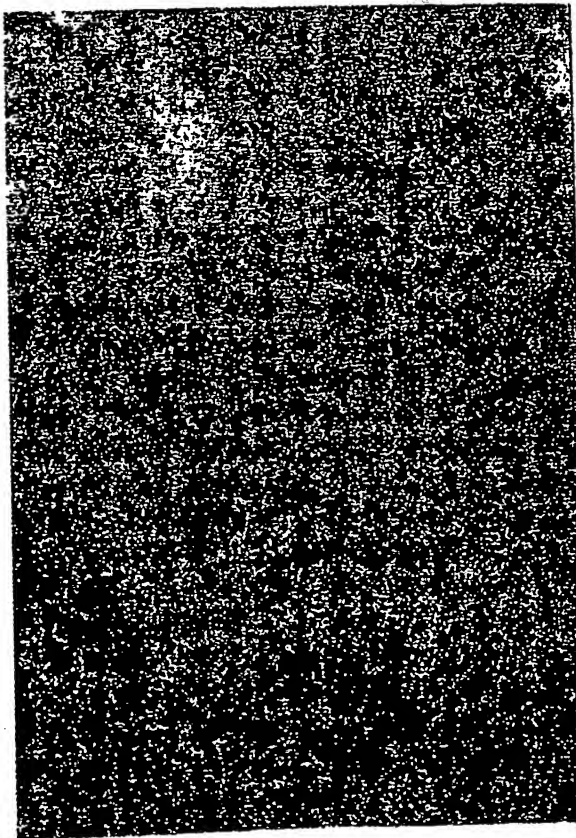


Fig. 43

**B**



**A**



**Fig. 44**

C

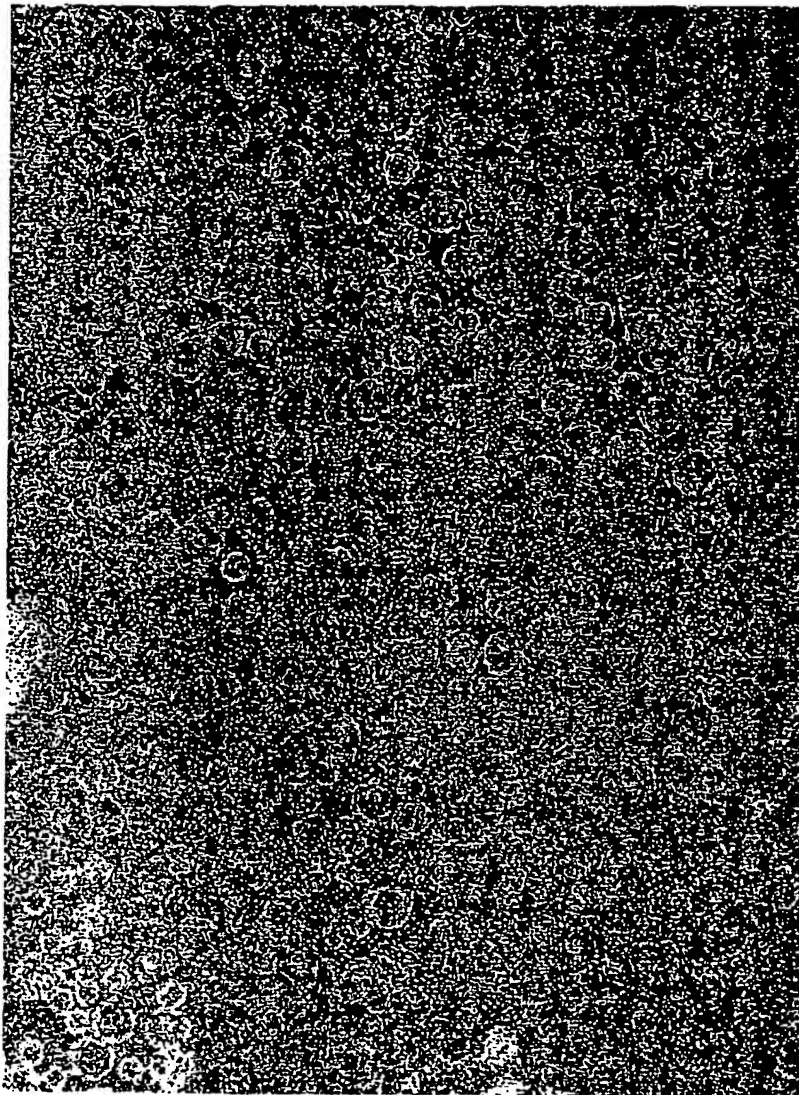


Fig. 44

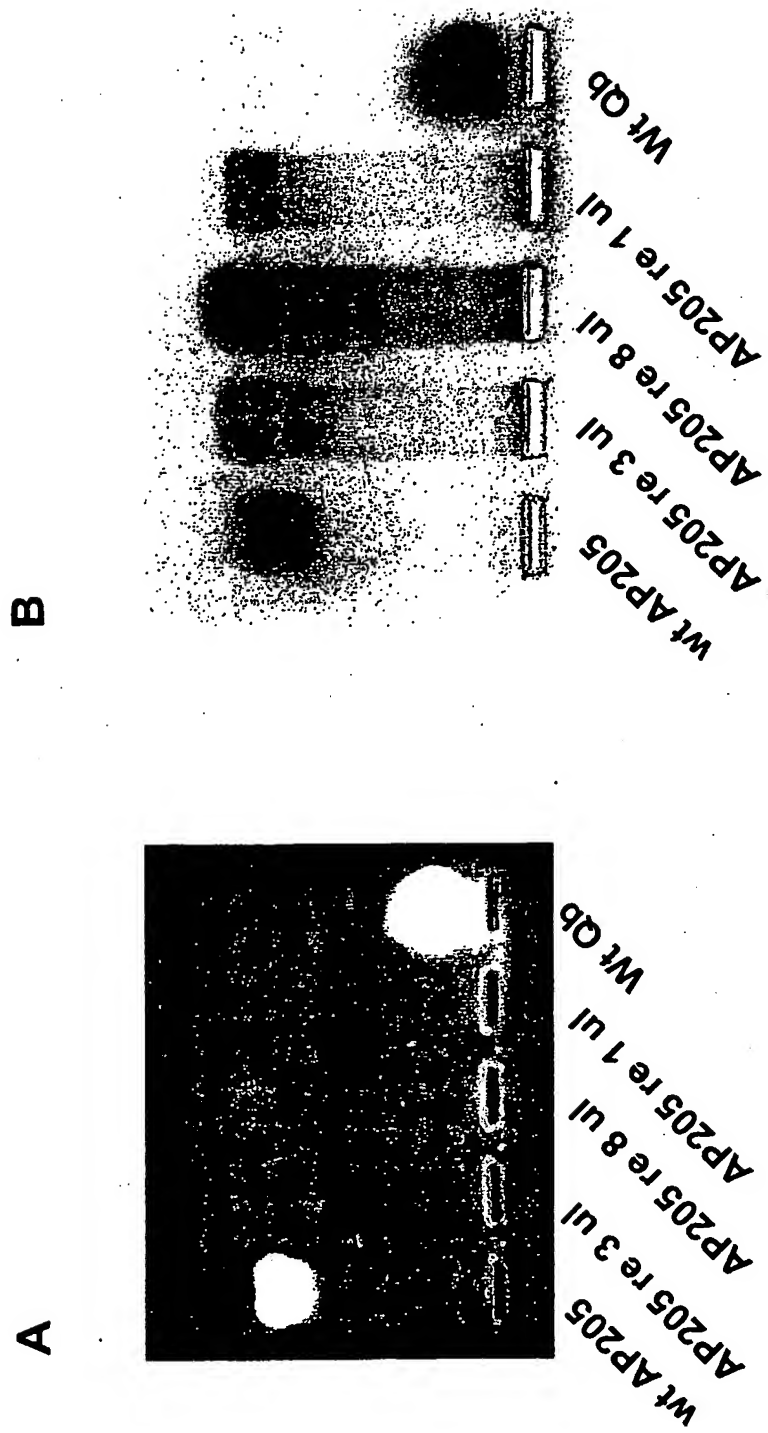


Fig. 45

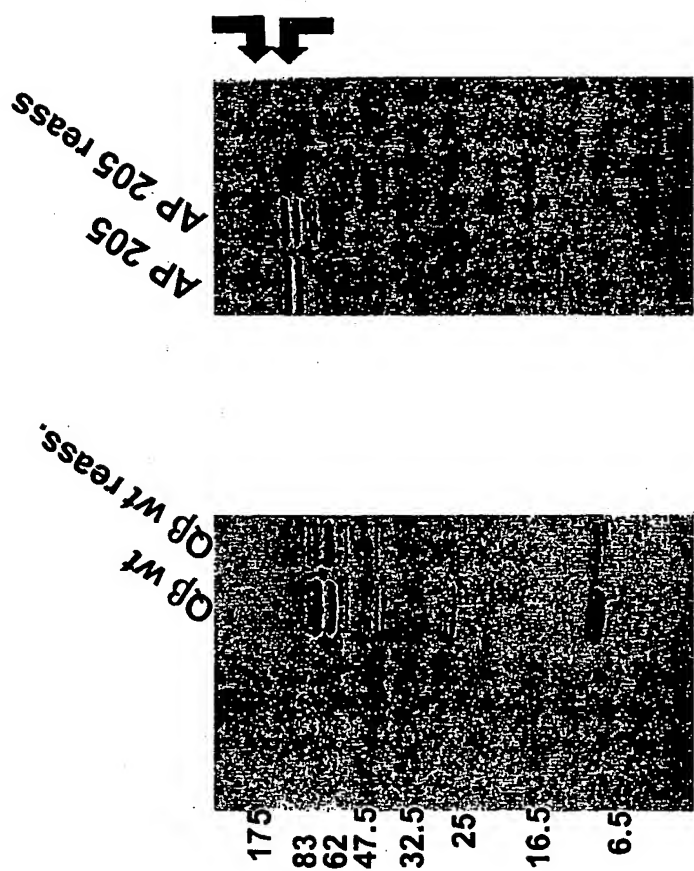


Fig. 46

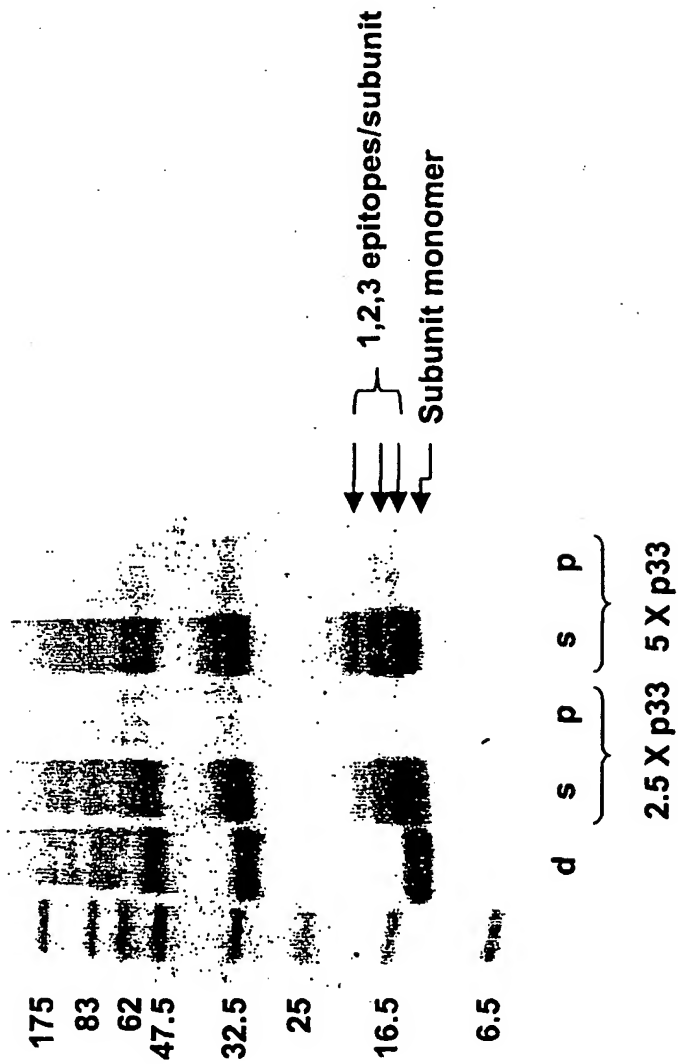


Fig. 47

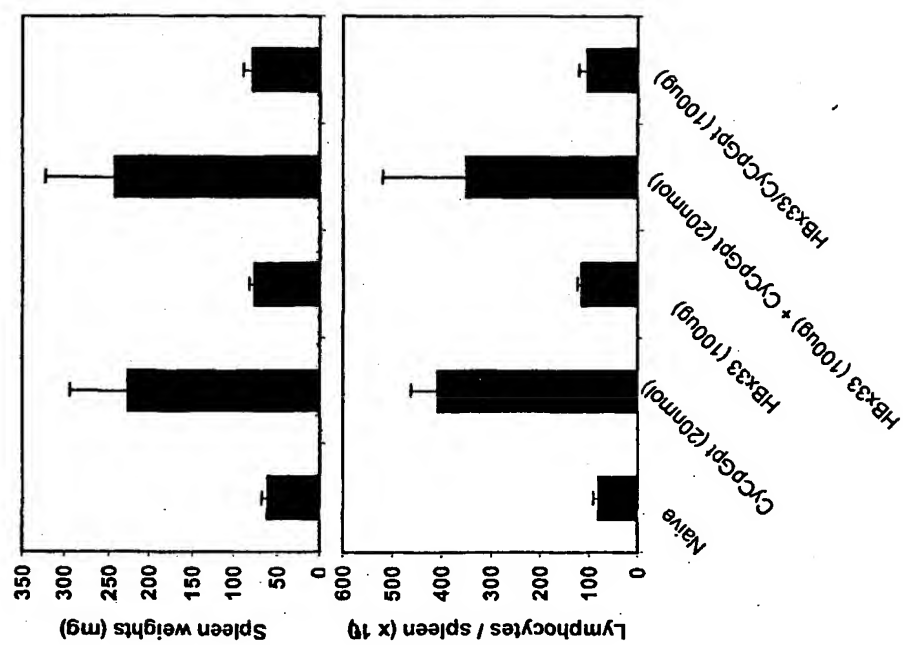


FIG. 48

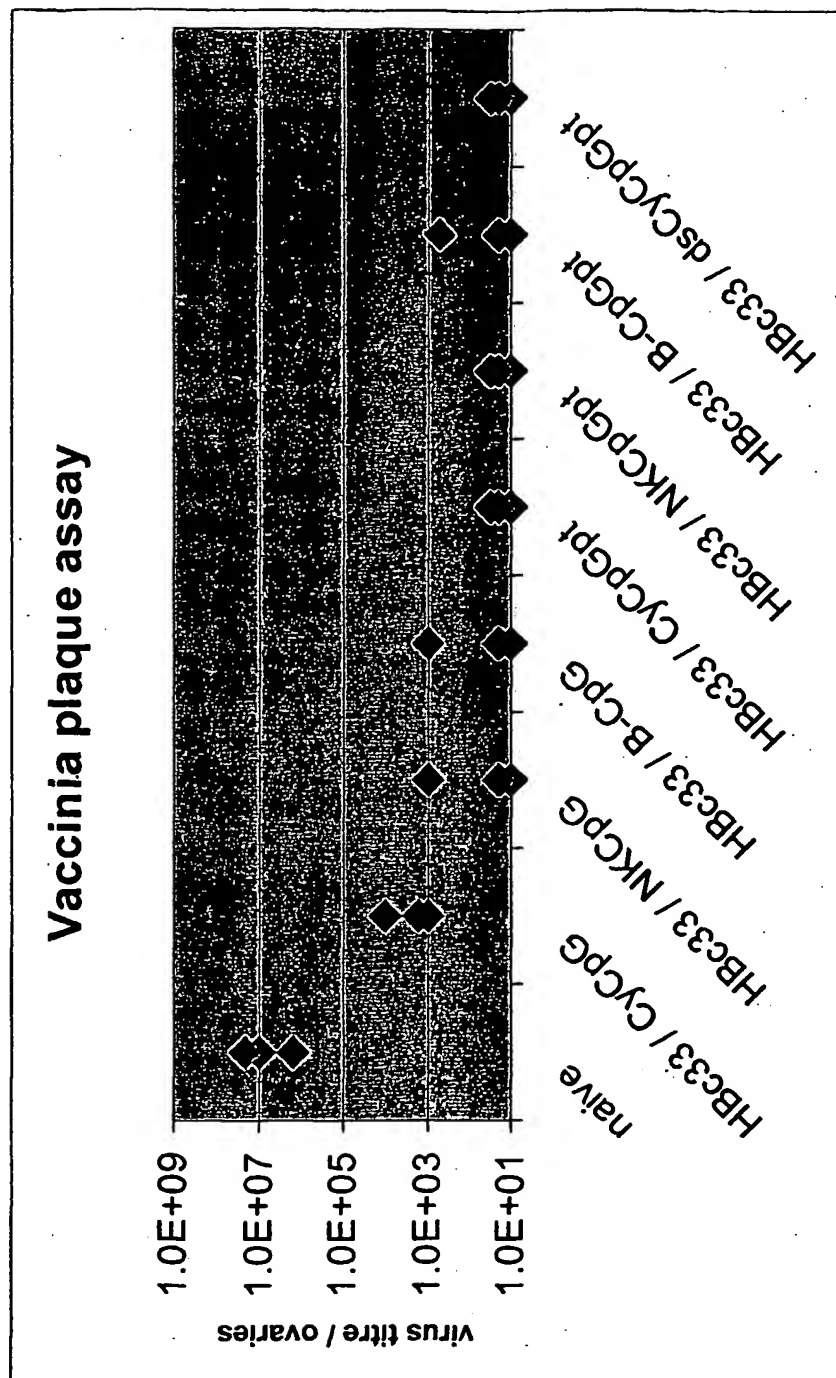


FIG. 49



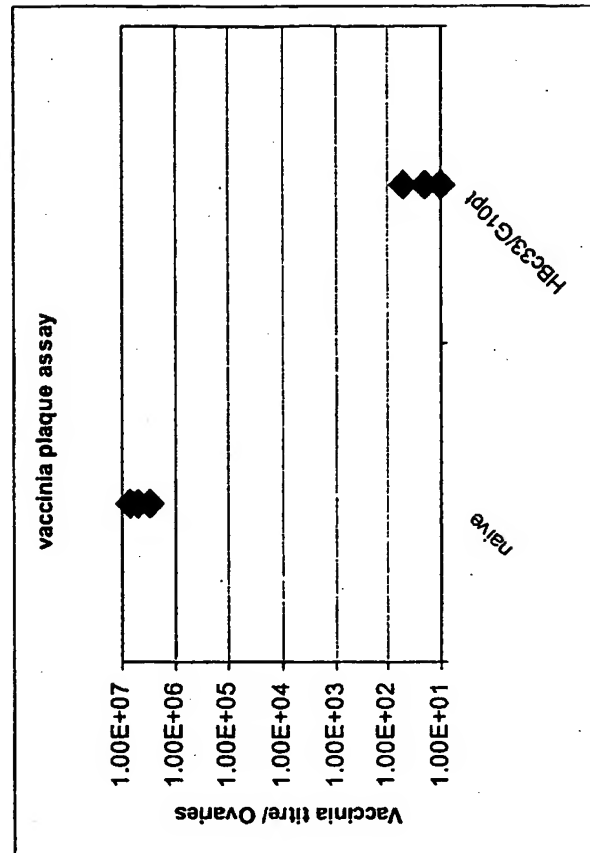


FIG. 50

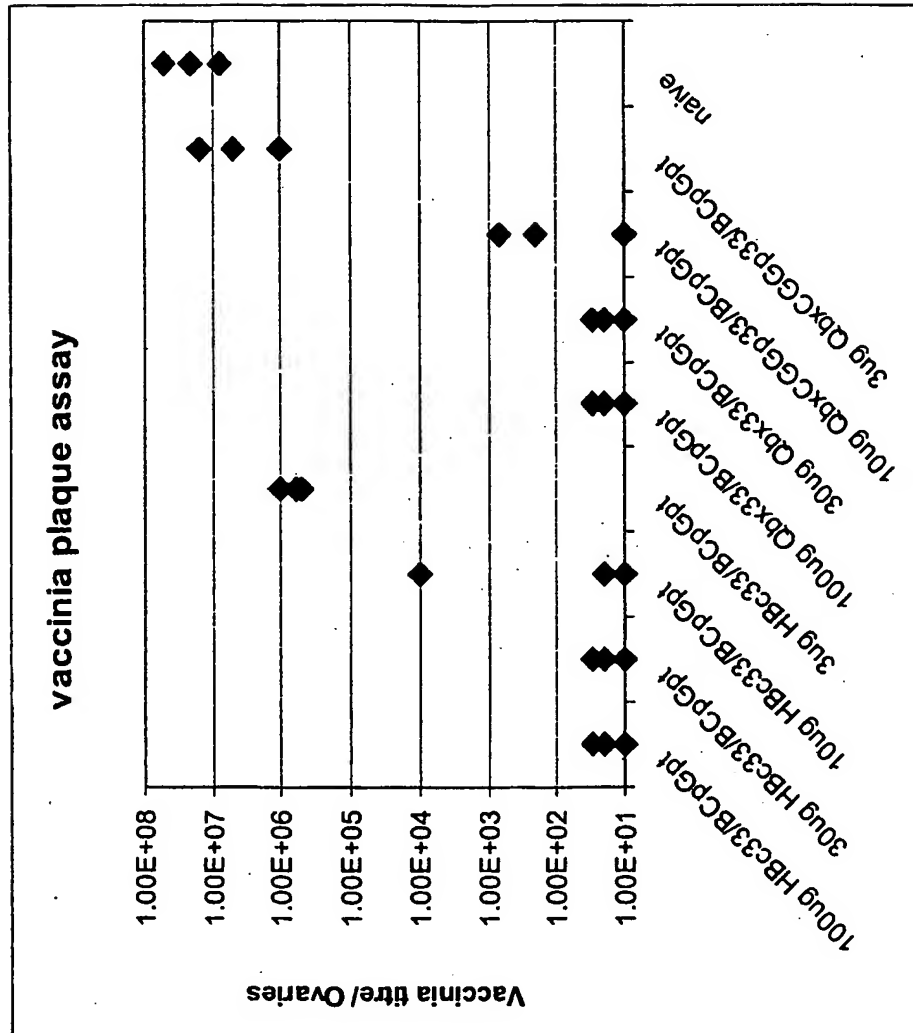


FIG. 51

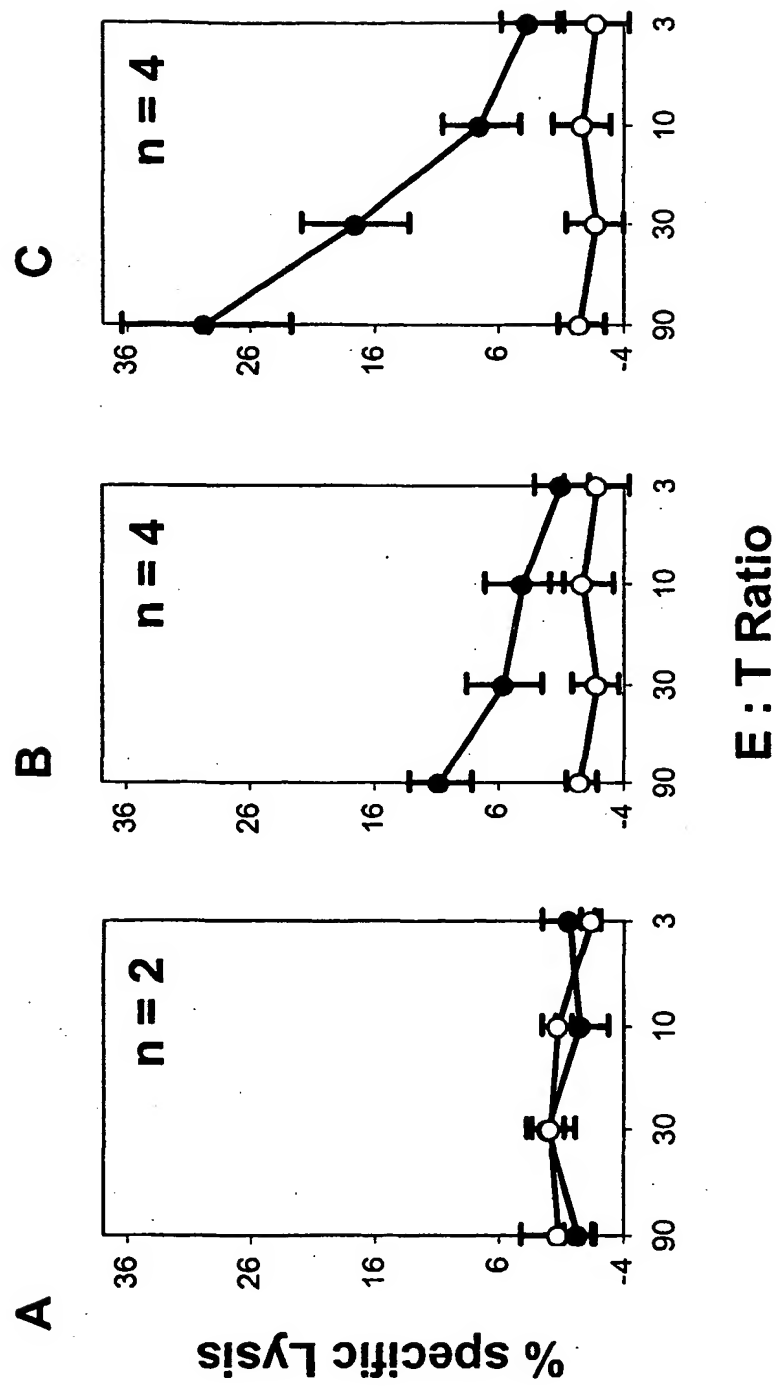


FIG. 52

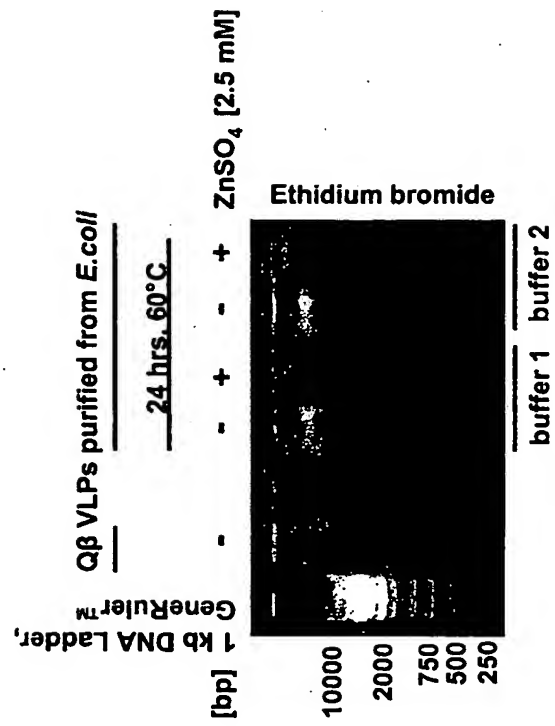


FIG. 53

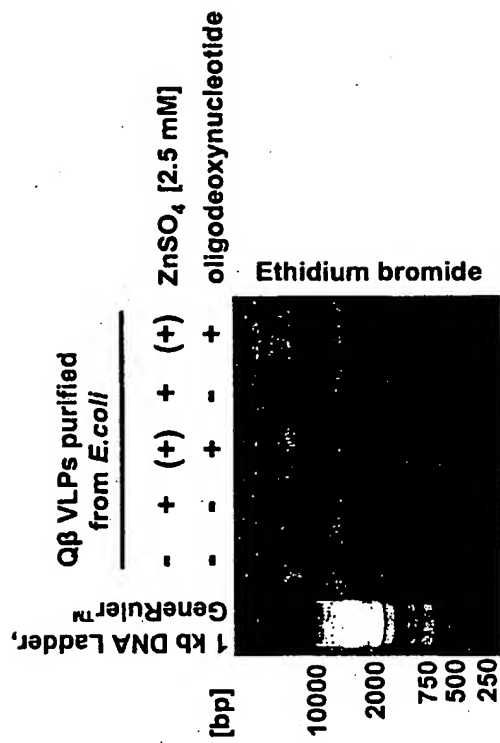


FIG. 54

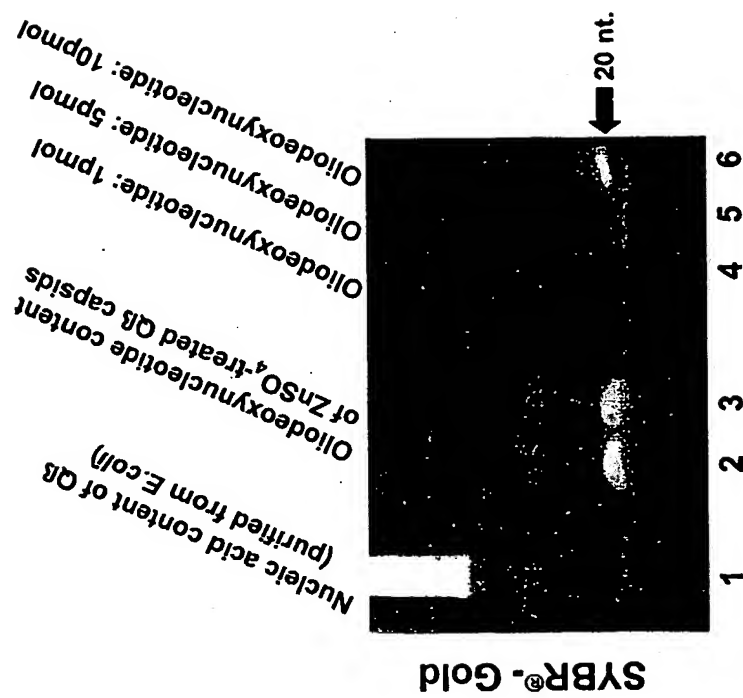


FIG. 55

-1-

## SEQUENCE LISTING

<110> Cytos Biotechnology AG

Bachmann, Martin F.

Storni, Tazio

Maurer, Patrick

Tissot, Alain

Schwarz, Katrin

Meijerink, Edwin

Lipowsky, Gerad

Pumpens, Paul

Cielens, Indulis

Renhofa, Regina

<120> Packaging of Immunostimulatory Substances into Virus-like Particles:  
Method of Preparation and Use

<130> 1700.022PC02

<140> To be assigned

<141> Herewith

<150> 60/374,145

<151> 2002-04-22

<150> 60/318,994

<151> 2001-09-14

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-2-

&lt;213&gt; Bacteriophage Q-beta

&lt;400&gt; 10

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	50					55					60				

Gln	Val	Lys	Ile	Gln	Asn	Pro	Thr	Ala	Cys	Thr	Ala	Asn	Gly	Ser	Cys
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Asp	Pro	Ser	Val	Thr	Arg	Gln	Ala	Tyr	Ala	Asp	Val	Thr	Phe	Ser	Phe
				85					90					95	

Thr	Gln	Tyr	Ser	Thr	Asp	Glu	Glu	Arg	Ala	Phe	Val	Arg	Thr	Glu	Leu
			100					105					110		

Ala	Ala	Leu	Leu	Ala	Ser	Pro	Leu	Leu	Ile	Asp	Ala	Ile	Asp	Gln	Leu
		115					120					125			

Asn	Pro	Ala	Tyr
			130

&lt;210&gt; 11

&lt;211&gt; 328

&lt;212&gt; PRT

&lt;213&gt; Bacteriophage Q-beta

&lt;400&gt; 11

Met	Ala	Lys	Leu	Glu	Thr	Val	Thr	Leu	Gly	Asn	Ile	Gly	Lys	Asp	Gly
1				5					10					15	

Lys	Gln	Thr	Leu	Val	Leu	Asn	Pro	Arg	Gly	Val	Asn	Pro	Thr	Asn	Gly
			20					25					30		



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Val Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
 35 40 45

Val Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys  
 50 55 60

Val Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser  
 65 70 75 80

Cys Asp Pro Ser Val Thr Arg Gln Ala Tyr Ala Asp Val Thr Phe Ser  
 85 90 95

Phe Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu  
 100 105 110

Leu Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln  
 115 120 125

Leu Asn Pro Ala Tyr Trp Leu Leu Ile Ala Gly Gly Gly Ser Gly Ser  
 130 135 140

Lys Pro Asp Pro Val Ile Pro Asp Pro Pro Ile Asp Pro Pro Pro Gly  
 145 150 155 160

Thr Gly Lys Tyr Thr Cys Pro Phe Ala Ile Trp Ser Leu Glu Glu Val  
 165 170 175

Tyr Glu Pro Pro Thr Lys Asn Arg Pro Trp Pro Ile Tyr Asn Ala Val  
 180 185 190

Glu Leu Gln Pro Arg Glu Phe Asp Val Ala Leu Lys Asp Leu Leu Gly  
 195 200 205

Asn Thr Lys Trp Arg Asp Trp Asp Ser Arg Leu Ser Tyr Thr Thr Phe  
 210 215 220

Arg Gly Cys Arg Gly Asn Gly Tyr Ile Asp Leu Asp Ala Thr Tyr Leu  
 225 230 235 240

Ala Thr Asp Gln Ala Met Arg Asp Gln Lys Tyr Asp Ile Arg Glu Gly  
 245 250 255

Lys Lys Pro Gly Ala Phe Gly Asn Ile Glu Arg Phe Ile Tyr Leu Lys  
 260 265 270

Ser Ile Asn Ala Tyr Cys Ser Leu Ser Asp Ile Ala Ala Tyr His Ala  
 275 280 285

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Asp Gly Val Ile Val Gly Phe Trp Arg Asp Pro Ser Ser Gly Gly Ala  
 290 295 300

Ile Pro Phe Asp Phe Thr Lys Phe Asp Lys Thr Lys Cys Pro Ile Gln  
 305 310 315 320

Ala Val Ile Val Val Pro Arg Ala  
 325

<210> 12

<211> 129

<212> PRT

<213> Bacteriophage R17

<400> 12

Ala Ser Asn Phe Thr Gln Phe Val Leu Val Asn Asp Gly Gly Thr Gly  
 1 5 10 15

Asn Val Thr Val Ala Pro Ser Asn Phe Ala Asn Gly Val Ala Glu Trp  
 20 25 30

Ile Ser Ser Asn Ser Arg Ser Gln Ala Tyr Lys Val Thr Cys Ser Val  
 35 40 45

Arg Gln Ser Ser Ala Gln Asn Arg Lys Tyr Thr Ile Lys Val Glu Val  
 50 55 60

Pro Lys Val Ala Thr Gln Thr Val Gly Gly Val Glu Leu Pro Val Ala  
 65 70 75 80

Ala Trp Arg Ser Tyr Leu Asn Met Glu Leu Thr Ile Pro Ile Phe Ala  
 85 90 95

Thr Asn Ser Asp Cys Glu Leu Ile Val Lys Ala Met Gln Gly Leu Leu  
 100 105 110

Lys Asp Gly Asn Pro Ile Pro Ser Ala Ile Ala Ala Asn Ser Gly Ile  
 115 120 125

Tyr

<210> 13

-5-

&lt;211&gt; 130

&lt;212&gt; PRT

&lt;213&gt; Bacteriophage fr

&lt;400&gt; 13

Met Ala Ser Asn Phe Glu Glu Phe Val Leu Val Asp Asn Gly Gly Thr  
 1 5 10 15

Gly Asp Val Lys Val Ala Pro Ser Asn Phe Ala Asn Gly Val Ala Glu  
 20 25 30

Trp Ile Ser Ser Asn Ser Arg Ser Gln Ala Tyr Lys Val Thr Cys Ser  
 35 40 45

Val Arg Gln Ser Ser Ala Asn Asn Arg Lys Tyr Thr Val Lys Val Glu  
 50 55 60

Val Pro Lys Val Ala Thr Gln Val Gln Gly Gly Val Glu Leu Pro Val  
 65 70 75 80

Ala Ala Trp Arg Ser Tyr Met Asn Met Glu Leu Thr Ile Pro Val Phe  
 85 90 95

Ala Thr Asn Asp Asp Cys Ala Leu Ile Val Lys Ala Leu Gln Gly Thr  
 100 105 110

Phe Lys Thr Gly Asn Pro Ile Ala Thr Ala Ile Ala Ala Asn Ser Gly  
 115 120 125

Ile Tyr  
 130

&lt;210&gt; 14

&lt;211&gt; 130

&lt;212&gt; PRT

&lt;213&gt; Bacteriophage GA

&lt;400&gt; 14

Met Ala Thr Leu Arg Ser Phe Val Leu Val Asp Asn Gly Gly Thr Gly  
 1 5 10 15

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Asn Val Thr Val Val Pro Val Ser Asn Ala Asn Gly Val Ala Glu Trp  
20 25 30

Leu Ser Asn Asn Ser Arg Ser Gln Ala Tyr Arg Val Thr Ala Ser Tyr  
35 40 45

Arg Ala Ser Gly Ala Asp Lys Arg Lys Tyr Ala Ile Lys Leu Glu Val  
50 55 60

Pro Lys Ile Val Thr Gln Val Val Asn Gly Val Glu Leu Pro Gly Ser  
65 70 75 80

Ala Trp Lys Ala Tyr Ala Ser Ile Asp Leu Thr Ile Pro Ile Phe Ala  
85 90 95

Ala Thr Asp Asp Val Thr Val Ile Ser Lys Ser Leu Ala Gly Leu Phe  
100 105 110

Lys Val Gly Asn Pro Ile Ala Glu Ala Ile Ser Ser Gln Ser Gly Phe  
115 120 125

Tyr Ala  
130

<210> 15

<211> 132

<212> PRT

<213> Bacteriophage SP

<400> 15

Met Ala Lys Leu Asn Gln Val Thr Leu Ser Lys Ile Gly Lys Asn Gly  
1 5 10 15

Asp Gln Thr Leu Thr Leu Thr Pro Arg Gly Val Asn Pro Thr Asn Gly  
20 25 30

Val Ala Ser Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
35 40 45

Val Thr Val Ser Val Ala Gln Pro Ser Arg Asn Arg Lys Asn Phe Lys  
50 55 60

Val Gln Ile Lys Leu Gln Asn Pro Thr Ala Cys Thr Arg Asp Ala Cys  
65 70 75 80

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Asp Pro Ser Val Thr Arg Ser Ala Phe Ala Asp Val Thr Leu Ser Phe  
85 90 95

Thr Ser Tyr Ser Thr Asp Glu Glu Arg Ala Leu Ile Arg Thr Glu Leu  
100 105 110

Ala Ala Leu Leu Ala Asp Pro Leu Ile Val Asp Ala Ile Asp Asn Leu  
115 120 125

Asn Pro Ala Tyr  
130

<210> 16

<211> 329

<212> PRT

<213> Bacteriophage SP

<400> 16

Ala Lys Leu Asn Gln Val Thr Leu Ser Lys Ile Gly Lys Asn Gly Asp  
1 5 10 15

Gln Thr Leu Thr Leu Thr Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
20 25 30

Ala Ser Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
35 40 45

Thr Val Ser Val Ala Gln Pro Ser Arg Asn Arg Lys Asn Phe Lys Val  
50 55 60

Gln Ile Lys Leu Gln Asn Pro Thr Ala Cys Thr Arg Asp Ala Cys Asp  
65 70 75 80

Pro Ser Val Thr Arg Ser Ala Phe Ala Asp Val Thr Leu Ser Phe Thr  
85 90 95

Ser Tyr Ser Thr Asp Glu Glu Arg Ala Leu Ile Arg Thr Glu Leu Ala  
100 105 110

Ala Leu Leu Ala Asp Pro Leu Ile Val Asp Ala Ile Asp Asn Leu Asn  
115 120 125

Pro Ala Tyr Trp Ala Ala Leu Leu Val Ala Ser Ser Gly Gly Gly Asp

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130                                      135                                      140  
 Asn Pro Ser Asp Pro Asp Val Pro Val Val Pro Asp Val Lys Pro Pro  
 145                                      150                                      155                                      160  
 Asp Gly Thr Gly Arg Tyr Lys Cys Pro Phe Ala Cys Tyr Arg Leu Gly  
                                     165                                      170                                      175  
 Ser Ile Tyr Glu Val Gly Lys Glu Gly Ser Pro Asp Ile Tyr Glu Arg  
                                     180                                      185                                      190  
 Gly Asp Glu Val Ser Val Thr Phe Asp Tyr Ala Leu Glu Asp Phe Leu  
                                     195                                      200                                      205  
 Gly Asn Thr Asn Trp Arg Asn Trp Asp Gln Arg Leu Ser Asp Tyr Asp  
                                     210                                      215                                      220  
 Ile Ala Asn Arg Arg Arg Cys Arg Gly Asn Gly Tyr Ile Asp Leu Asp  
 225                                      230                                      235                                      240  
 Ala Thr Ala Met Gln Ser Asp Asp Phe Val Leu Ser Gly Arg Tyr Gly  
                                     245                                      250                                      255  
 Val Arg Lys Val Lys Phe Pro Gly Ala Phe Gly Ser Ile Lys Tyr Leu  
                                     260                                      265                                      270  
 Leu Asn Ile Gln Gly Asp Ala Trp Leu Asp Leu Ser Glu Val Thr Ala  
                                     275                                      280                                      285  
 Tyr Arg Ser Tyr Gly Met Val Ile Gly Phe Trp Thr Asp Ser Lys Ser  
                                     290                                      295                                      300  
 Pro Gln Leu Pro Thr Asp Phe Thr Gln Phe Asn Ser Ala Asn Cys Pro  
 305                                      310                                      315                                      320  
 Val Gln Thr Val Ile Ile Ile Pro Ser  
                                     325

&lt;210&gt; 17

&lt;211&gt; 130

&lt;212&gt; PRT

&lt;213&gt; Bacteriophage MS2

&lt;400&gt; 17

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Met Ala Ser Asn Phe Thr Gln Phe Val Leu Val Asp Asn Gly Gly Thr  
 1 5 10 15

Gly Asp Val Thr Val Ala Pro Ser Asn Phe Ala Asn Gly Val Ala Glu  
 20 25 30

Trp Ile Ser Ser Asn Ser Arg Ser Gln Ala Tyr Lys Val Thr Cys Ser  
 35 40 45

Val Arg Gln Ser Ser Ala Gln Asn Arg Lys Tyr Thr Ile Lys Val Glu  
 50 55 60

Val Pro Lys Val Ala Thr Gln Thr Val Gly Gly Val Glu Leu Pro Val  
 65 70 75 80

Ala Ala Trp Arg Ser Tyr Leu Asn Met Glu Leu Thr Ile Pro Ile Phe  
 85 90 95

Ala Thr Asn Ser Asp Cys Glu Leu Ile Val Lys Ala Met Gln Gly Leu  
 100 105 110

Leu Lys Asp Gly Asn Pro Ile Pro Ser Ala Ile Ala Ala Asn Ser Gly  
 115 120 125

Ile Tyr  
 130

<210> 18

<211> 133

<212> PRT

<213> Bacteriophage M11

<400> 18

Met Ala Lys Leu Gln Ala Ile Thr Leu Ser Gly Ile Gly Lys Lys Gly  
 1 5 10 15

Asp Val Thr Leu Asp Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly  
 20 25 30

Val Ala Ala Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
 35 40 45

Val Thr Ile Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys  
 50 55 60

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Val Gln Val Lys Ile Gln Asn Pro Thr Ser Cys Thr Ala Ser Gly Thr  
65 70 75 80

Cys Asp Pro Ser Val Thr Arg Ser Ala Tyr Ser Asp Val Thr Phe Ser  
85 90 95

Phe Thr Gln Tyr Ser Thr Val Glu Glu Arg Ala Leu Val Arg Thr Glu  
100 105 110

Leu Gln Ala Leu Leu Ala Asp Pro Met Leu Val Asn Ala Ile Asp Asn  
115 120 125

Leu Asn Pro Ala Tyr  
130

<210> 19

<211> 133

<212> PRT

<213> Bacteriophage MX1

<400> 19

Met Ala Lys Leu Gln Ala Ile Thr Leu Ser Gly Ile Gly Lys Asn Gly  
1 5 10 15

Asp Val Thr Leu Asn Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly  
20 25 30

Val Ala Ala Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
35 40 45

Val Thr Ile Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys  
50 55 60

Val Gln Val Lys Ile Gln Asn Pro Thr Ser Cys Thr Ala Ser Gly Thr  
65 70 75 80

Cys Asp Pro Ser Val Thr Arg Ser Ala Tyr Ala Asp Val Thr Phe Ser  
85 90 95

Phe Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Leu Val Arg Thr Glu  
100 105 110

Leu Lys Ala Leu Leu Ala Asp Pro Met Leu Ile Asp Ala Ile Asp Asn



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115

120

125

Leu Asn Pro Ala Tyr  
130

&lt;210&gt; 20

&lt;211&gt; 330

&lt;212&gt; PRT

&lt;213&gt; Bacteriophage NL95

&lt;400&gt; 20

Met Ala Lys Leu Asn Lys Val Thr Leu Thr Gly Ile Gly Lys Ala Gly  
1 5 10 15

Asn Gln Thr Leu Thr Leu Thr Pro Arg Gly Val Asn Pro Thr Asn Gly  
20 25 30

Val Ala Ser Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
35 40 45

Val Thr Val Ser Val Ala Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys  
50 55 60

Val Gln Ile Lys Leu Gln Asn Pro Thr Ala Cys Thr Lys Asp Ala Cys  
65 70 75 80

Asp Pro Ser Val Thr Arg Ser Gly Ser Arg Asp Val Thr Leu Ser Phe  
85 90 95

Thr Ser Tyr Ser Thr Glu Arg Glu Arg Ala Leu Ile Arg Thr Glu Leu  
100 105 110

Ala Ala Leu Leu Lys Asp Asp Leu Ile Val Asp Ala Ile Asp Asn Leu  
115 120 125

Asn Pro Ala Tyr Trp Ala Ala Leu Leu Ala Ala Ser Pro Gly Gly Gly  
130 135 140

Asn Asn Pro Tyr Pro Gly Val Pro Asp Ser Pro Asn Val Lys Pro Pro  
145 150 155 160

Gly Gly Thr Gly Thr Tyr Arg Cys Pro Phe Ala Cys Tyr Arg Arg Gly  
165 170 175

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Glu Leu Ile Thr Glu Ala Lys Asp Gly Ala Cys Ala Leu Tyr Ala Cys  
180 185 190

Gly Ser Glu Ala Leu Val Glu Phe Glu Tyr Ala Leu Glu Asp Phe Leu  
195 200 205

Gly Asn Glu Phe Trp Arg Asn Trp Asp Gly Arg Leu Ser Lys Tyr Asp  
210 215 220

Ile Glu Thr His Arg Arg Cys Arg Gly Asn Gly Tyr Val Asp Leu Asp  
225 230 235 240

Ala Ser Val Met Gln Ser Asp Glu Tyr Val Leu Ser Gly Ala Tyr Asp  
245 250 255

Val Val Lys Met Gln Pro Pro Gly Thr Phe Asp Ser Pro Arg Tyr Tyr  
260 265 270

Leu His Leu Met Asp Gly Ile Tyr Val Asp Leu Ala Glu Val Thr Ala  
275 280 285

Tyr Arg Ser Tyr Gly Met Val Ile Gly Phe Trp Thr Asp Ser Lys Ser  
290 295 300

Pro Gln Leu Pro Thr Asp Phe Thr Arg Phe Asn Arg His Asn Cys Pro  
305 310 315 320

Val Gln Thr Val Ile Val Ile Pro Ser Leu  
325 330

<210> 21

<211> 129

<212> PRT

<213> Bacteriophage f2

<400> 21

Ala Ser Asn Phe Thr Gln Phe Val Leu Val Asn Asp Gly Gly Thr Gly  
1 5 10 15

Asn Val Thr Val Ala Pro Ser Asn Phe Ala Asn Gly Val Ala Glu Trp  
20 25 30

Ile Ser Ser Asn Ser Arg Ser Gln Ala Tyr Lys Val Thr Cys Ser Val  
35 40 45

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Arg Gln Ser Ser Ala Gln Asn Arg Lys Tyr Thr Ile Lys Val Glu Val  
50 55 60

Pro Lys Val Ala Thr Gln Thr Val Gly Gly Val Glu Leu Pro Val Ala  
65 70 75 80

Ala Trp Arg Ser Tyr Leu Asn Leu Glu Leu Thr Ile Pro Ile Phe Ala  
85 90 95

Thr Asn Ser Asp Cys Glu Leu Ile Val Lys Ala Met Gln Gly Leu Leu  
100 105 110

Lys Asp Gly Asn Pro Ile Pro Ser Ala Ile Ala Ala Asn Ser Gly Ile  
115 120 125

Tyr

<210> 22

<211> 128

<212> PRT

<213> Bacteriophage PP7

<400> 22

Met Ser Lys Thr Ile Val Leu Ser Val Gly Glu Ala Thr Arg Thr Leu  
1 5 10 15

Thr Glu Ile Gln Ser Thr Ala Asp Arg Gln Ile Phe Glu Glu Lys Val  
20 25 30

Gly Pro Leu Val Gly Arg Leu Arg Leu Thr Ala Ser Leu Arg Gln Asn  
35 40 45

Gly Ala Lys Thr Ala Tyr Arg Val Asn Leu Lys Leu Asp Gln Ala Asp  
50 55 60

Val Val Asp Cys Ser Thr Ser Val Cys Gly Glu Leu Pro Lys Val Arg  
65 70 75 80

Tyr Thr Gln Val Trp Ser His Asp Val Thr Ile Val Ala Asn Ser Thr  
85 90 95

Glu Ala Ser Arg Lys Ser Leu Tyr Asp Leu Thr Lys Ser Leu Val Ala

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100

105

110

Thr Ser Gln Val Glu Asp Leu Val Val Asn Leu Val Pro Leu Gly Arg  
 115 120 125

&lt;210&gt; 23

&lt;211&gt; 132

&lt;212&gt; PRT

&lt;213&gt; Bacteriophage Q-beta

&lt;400&gt; 23

Ala Lys Leu Glu Thr Val Thr Leu Gly Asn Ile Gly Arg Asp Gly Lys  
 1 5 10 15

Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
 20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
 35 40 45

Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
 50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys  
 65 70 75 80

Asp Pro Ser Val Thr Arg Gln Lys Tyr Ala Asp Val Thr Phe Ser Phe  
 85 90 95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu  
 100 105 110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
 115 120 125

Asn Pro Ala Tyr  
 130

&lt;210&gt; 24

&lt;211&gt; 132

&lt;212&gt; PRT

&lt;213&gt; Bacteriophage Q-beta

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&lt;400&gt; 24

Ala Lys Leu Glu Thr Val Thr Leu Gly Lys Ile Gly Lys Asp Gly Lys  
 1 5 10 15

Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
 20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
 35 40 45

Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
 50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys  
 65 70 75 80

Asp Pro Ser Val Thr Arg Gln Lys Tyr Ala Asp Val Thr Phe Ser Phe  
 85 90 95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu  
 100 105 110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
 115 120 125

Asn Pro Ala Tyr  
 130

&lt;210&gt; 25

&lt;211&gt; 132

&lt;212&gt; PRT

&lt;213&gt; Bacteriophage Q-beta

&lt;400&gt; 25

Ala Arg Leu Glu Thr Val Thr Leu Gly Asn Ile Gly Arg Asp Gly Lys  
 1 5 10 15

Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
 20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
 35 40 45

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Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys  
65 70 75 80

Asp Pro Ser Val Thr Arg Gln Lys Tyr Ala Asp Val Thr Phe Ser Phe  
85 90 95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu  
100 105 110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
115 120 125

Asn Pro Ala Tyr  
130

<210> 26

<211> 132

<212> PRT

<213> Bacteriophage Q-beta

<400> 26

Ala Lys Leu Glu Thr Val Thr Leu Gly Asn Ile Gly Lys Asp Gly Arg  
1 5 10 15

Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
35 40 45

Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys  
65 70 75 80

Asp Pro Ser Val Thr Arg Gln Lys Tyr Ala Asp Val Thr Phe Ser Phe  
85 90 95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu

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100

105

110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
 115 120 125

Asn Pro Ala Tyr  
 130

&lt;210&gt; 27

&lt;211&gt; 132

&lt;212&gt; PRT

&lt;213&gt; Bacteriophage Q-beta

&lt;400&gt; 27

Ala Arg Leu Glu Thr Val Thr Leu Gly Asn Ile Gly Lys Asp Gly Arg  
 1 5 10 15

Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
 20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
 35 40 45

Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
 50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys  
 65 70 75 80

Asp Pro Ser Val Thr Arg Gln Lys Tyr Ala Asp Val Thr Phe Ser Phe  
 85 90 95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu  
 100 105 110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
 115 120 125

Asn Pro Ala Tyr  
 130

&lt;210&gt; 28

&lt;211&gt; 184

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&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 28

Met Asp Ile Asp Pro Tyr Glu Phe Gly Ala Thr Val Glu Leu Leu Ser  
 1 5 10 15

Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr  
 20 25 30

Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser  
 35 40 45

Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu  
 50 55 60

Met Thr Leu Ala Thr Trp Val Gly Asn Asn Leu Glu Asp Pro Ala Ser  
 65 70 75 80

Arg Asp Leu Val Val Asn Tyr Val Asn Thr Asn Met Gly Leu Lys Ile  
 85 90 95

Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu  
 100 105 110

Thr Val Leu Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro  
 115 120 125

Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu  
 130 135 140

Thr Thr Val Val Arg Arg Arg Asp Arg Gly Arg Ser Pro Arg Arg Arg  
 145 150 155 160

Thr Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg  
 165 170 175

Ser Gln Ser Arg Glu Ser Gln Cys  
 180

&lt;210&gt; 29

&lt;211&gt; 183

&lt;212&gt; PRT



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&lt;213&gt; Hepatitis B virus

&lt;400&gt; 29

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
 20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Ile  
 65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
 85 90 95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Thr Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Gly Ser Gln Cys  
 180

&lt;210&gt; 30

&lt;211&gt; 183

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

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&lt;400&gt; 30

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
 20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Thr  
 65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
 85 90 95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Thr Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Cys Val Ile Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Gly Ser Gln Cys  
 180

&lt;210&gt; 31

&lt;211&gt; 212

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 31

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Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
85 90 95

Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Ile Ser Arg Asp  
100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
195 200 205

Glu Ser Gln Cys  
210

<210> 32

<211> 212

<212> PRT

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&lt;213&gt; Hepatitis B virus

&lt;400&gt; 32

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Asn Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Ile Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

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&lt;210&gt; 33

&lt;211&gt; 183

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 33

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

Ser Phe Leu Pro Thr Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
 20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala  
 65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
 85 90 95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Cys Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Glu Ser Gln Cys  
 180

&lt;210&gt; 34

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&lt;211&gt; 212

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 34

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Val Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Val Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

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Glu Ser Gln Cys  
210

<210> 35

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 35

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Asp Met Asp Ile  
20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp Leu Met Thr  
85 90 95

Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Val Ser Arg Asp  
100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Val Gly Leu Lys Phe Arg Gln  
115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
180 185 190

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Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 36

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 36

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro Gln  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Ile Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr



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165

170

175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

&lt;210&gt; 37

&lt;211&gt; 212

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 37

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

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Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
145 150 155 160

Tyr Lys Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
195 200 205

Gly Ser Gln Cys  
210

<210> 38

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 38

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
20 25 30

Thr Ala Ser Ala Leu Phe Arg Asp Ala Leu Glu Ser Pro Glu His Cys  
35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Ala  
65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
85 90 95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
100 105 110

Asp Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
115 120 125

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Pro Pro Ala Tyr Arg Pro Ser Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Cys Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Glu Ser Gln Cys  
 180

<210> 39

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 39

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
 20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala  
 65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
 85 90 95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro

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130

135

140

Glu Thr Thr Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Glu Ser Gln Cys  
 180

&lt;210&gt; 40

&lt;211&gt; 212

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 40

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg His Ala Ile Leu Cys Trp Gly Asp Leu Arg Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Ile Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Tyr Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

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Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
195 200 205

Glu Ser Gln Cys  
210

<210> 41

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 41

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Asp Met Asp Ile  
20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
50 55 60

Ala Leu Phe Arg Asp Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
85 90 95

Leu Ala Thr Trp Val Gly Ala Asn Leu Glu Asp Pro Ala Ser Arg Asp  
100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
115 120 125

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Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Gln Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Cys  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 42

<211> 183

<212> PRT

<213> Artificial Sequence

<220>

<223> Synthetic human Hepatitis B virus core protein gene

<400> 42

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
 20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala  
 65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys

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85

90

95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Leu Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Thr Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Glu Ser Gln Cys  
 180

&lt;210&gt; 43

&lt;211&gt; 212

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 43

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp Leu Met Ser  
 85 90 95

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Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ile Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 44

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 44

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
 20 25 30

Thr Ala Ser Ala Leu Tyr Arg Asp Ala Leu Glu Ser Pro Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala  
 65 70 75 80



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Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
85 90 95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
130 135 140

Glu Thr Thr Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
165 170 175

Gln Ser Arg Glu Ser Gln Cys  
180

<210> 45

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 45

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp  
50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala  
65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys

-36-

85

90

95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Thr Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Glu Ser Gln Cys  
 180

<210> 46

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 46

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
 20 25 30

Thr Ala Ser Ala Leu Tyr Arg Asp Ala Leu Glu Ser Pro Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Ala Asn Leu Glu Asp Pro Ala  
 65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
 85 90 95

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Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Thr Val Val Arg Arg Arg Gly Arg Thr Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Glu Ser Gln Cys  
 180

<210> 47

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 47

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Asp Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
 100 105 110

-38-

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 48

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 48

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp Leu Met Thr

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85

90

95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 49

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 49

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Thr Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Gln Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

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Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
130 135 140

Ile Glu Tyr Leu Val Ala Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
195 200 205

Glu Ser Gln Cys  
210

<210> 50

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 50

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
35 40 45

-41-

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Phe Glu Cys Ser Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Ile Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 51

<211> 212

<212> PRT

<213> Hepatitis B virus

<220>

<221> MISC\_FEATURE

<222> (28)..(28)

<223> Xaa can be any amino acid

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&lt;400&gt; 51

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Xaa Asp Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp Leu Ile Thr  
 85 90 95

Leu Ser Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Thr Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Thr Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

&lt;210&gt; 52



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&lt;211&gt; 212

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 52

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Asn Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

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Glu Ser Gln Cys  
210

<210> 53

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 53 .

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
115 120 125

Leu Leu Trp Phe His Ile Cys Cys Leu Thr Phe Gly Arg Glu Thr Val  
130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
180 185 190

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Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 54

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 54

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr

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165

170

175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
                   180                  185                  190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
                   195                  200                  205

Glu Pro Gln Cys  
       210

&lt;210&gt; 55

&lt;211&gt; 212

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 55

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
   1                  5                  10                  15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
                   20                  25                  30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
                   35                  40                  45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Ser Thr Ala Ser  
       50                  55                  60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
   65                  70                  75                  80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
                   85                  90                  95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
                   100                  105                  110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
                   115                  120                  125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
       130                  135                  140

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Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 56

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 56

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

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Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Leu Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 57

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 57

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp

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100

105

110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Lys Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

<210> 58

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 58

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ala  
 50 55 60

Ala Leu Tyr Arg Asp Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

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His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
85 90 95

Leu Ala Thr Trp Val Gly Thr Asn Leu Glu Asp Pro Ala Ser Arg Asp  
100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
130 135 140

Leu Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
195 200 205

Glu Ser Gln Cys  
210

<210> 59

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 59

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Ser Met Glu Leu Leu  
1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Tyr Pro Ser Val Arg Asp Leu Leu Asp  
20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
35 40 45

Thr Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
50 55 60



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Leu Met Thr Leu Ala Thr Trp Val Gly Gly Asn Leu Gln Asp Pro Thr  
65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
85 90 95

Phe Arg Gln Leu Leu Trp Phe His Val Ser Cys Leu Thr Phe Gly Arg  
100 105 110

Glu Thr Val Val Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
115 120 125

Pro Gln Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
130 135 140

Glu Thr Cys Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
165 170 175

Gln Ser Arg Glu Ser Gln Cys  
180

<210> 60

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 60

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
35 40 45

Ser Pro His His Thr Ala Leu Arg His Val Phe Leu Cys Trp Gly Asp  
50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Thr

65					70					75					80
Ser	Arg	Asp	Leu	Val	Val	Ser	Tyr	Val	Asn	Thr	Asn	Met	Gly	Leu	Lys
			85						90					95	
Phe	Arg	Gln	Leu	Leu	Trp	Phe	His	Ile	Ser	Cys	Leu	Thr	Phe	Gly	Arg
			100					105					110		
Glu	Thr	Val	Ile	Glu	Tyr	Leu	Val	Ser	Phe	Gly	Val	Trp	Ile	Arg	Thr
		115					120					125			
Pro	Pro	Ala	Tyr	Arg	Pro	Pro	Asn	Ala	Pro	Ile	Leu	Ser	Thr	Leu	Pro
	130					135					140				
Glu	Thr	Thr	Val	Val	Arg	Arg	Arg	Gly	Arg	Ser	Pro	Arg	Arg	Arg	Thr
145					150					155					160
Pro	Ser	Pro	Arg	Arg	Arg	Arg	Ser	Gln	Ser	Pro	Arg	Arg	Arg	Arg	Ser
				165					170					175	
Gln	Ser	Arg	Glu	Ser	Gln	Cys									
			180												
<210>	61														
<211>	212														
<212>	PRT														
<213>	Hepatitis B virus														
<400>	61														
Met	Gln	Leu	Phe	His	Leu	Cys	Leu	Ile	Ile	Ser	Cys	Ser	Cys	Pro	Thr
1				5					10					15	
Val	Gln	Ala	Ser	Lys	Leu	Cys	Leu	Gly	Trp	Leu	Trp	Gly	Met	Asp	Ile
			20					25					30		
Asp	Pro	Tyr	Lys	Glu	Phe	Gly	Ala	Thr	Val	Glu	Leu	Leu	Ser	Phe	Leu
		35					40					45			
Pro	Ser	Asp	Phe	Phe	Pro	Ser	Val	Arg	Asp	Leu	Leu	Asp	Thr	Ala	Ser
	50					55					60				
Ala	Leu	Tyr	Arg	Glu	Ala	Leu	Glu	Ser	Pro	Glu	His	Cys	Ser	Pro	His
65					70					75					80

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His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp Leu Thr Thr  
85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
195 200 205

Glu Ser Gln Cys  
210

<210> 62

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 62

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
50 55 60

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Ala Leu Tyr Arg Asp Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Ile Phe Gly Arg Glu Thr Val  
130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
195 200 205

Glu Ser Gln Cys  
210

<210> 63

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 63

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys

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35

40

45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Val  
 65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Val Gly Leu Lys  
 85 90 95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Thr Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Ala Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Glu Ser Gln Cys  
 180

&lt;210&gt; 64

&lt;211&gt; 213

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 64

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

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Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp Leu Met Asn  
 85 90 95

Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Val Ser Arg Asp  
 100 105 110

Leu Val Val Gly Tyr Val Asn Thr Thr Val Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser  
 195 200 205

Arg Glu Ser Gln Cys  
 210

<210> 65

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 65

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
 20 25 30

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Thr Ala Ser Ala Leu Tyr Arg Asp Ala Leu Glu Ser Pro Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala  
 65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
 85 90 95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Thr Val Val Arg Arg Arg Gly Arg Thr Pro Arg Arg Arg Thr  
 145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
 165 170 175

Gln Ser Arg Glu Ser Gln Cys  
 180

<210> 66

<211> 212

<212> PRT

<213> Hepatitis B virus

<400> 66

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu

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35                                      40                                      45  
 Pro Ser Asp Phe Phe Pro Ser Val Arg Ala Leu Leu Asp Thr Ala Ser  
     50                                      55                                      60  
 Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
     65                                      70                                      75                                      80  
 His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
                                     85                                      90                                      95  
 Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
                                     100                                      105                                      110  
 Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
                                     115                                      120                                      125  
 Ile Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
                                     130                                      135                                      140  
 Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
     145                                      150                                      155                                      160  
 Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
                                     165                                      170                                      175  
 Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
                                     180                                      185                                      190  
 Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
                                     195                                      200                                      205  
 Glu Ser Gln Cys  
     210  
 <210> 67  
 <211> 212  
 <212> PRT  
 <213> Hepatitis B virus  
 <400> 67  
 Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
     1                                      5                                      10                                      15



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Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
                   20                  25                  30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
                   35                  40                  45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
                   50                  55                  60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
   65                  70                  75                  80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp Leu Met Thr  
                   85                  90                  95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Thr Arg Asp  
                   100                  105                  110

Leu Val Val Ser Tyr Val Asn Thr Asn Val Gly Leu Lys Phe Arg Gln  
                   115                  120                  125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
                   130                  135                  140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
   145                  150                  155                  160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
                   165                  170                  175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
                   180                  185                  190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
                   195                  200                  205

Glu Ser Gln Cys  
                   210

<210> 68

<211> 212

<212> PRT

<213> Hepatitis B virus

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&lt;400&gt; 68

Met Gln Leu Phe His Leu Cys Leu Ile Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ser  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Arg Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Val Asn Leu Glu Asp Pro Ala Ser Arg Asp  
 100 105 110

Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys Phe Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Thr Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

&lt;210&gt; 69

&lt;211&gt; 212

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&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 69

Met Gln Leu Phe His Leu Cys Leu Val Ile Ser Cys Ser Cys Pro Thr  
 1 5 10 15

Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Gly Met Asp Ile  
 20 25 30

Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu Ser Phe Leu  
 35 40 45

Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp Thr Ala Ala  
 50 55 60

Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys Ser Pro His  
 65 70 75 80

His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu Leu Met Thr  
 85 90 95

Leu Ala Thr Trp Val Gly Asn Asn Leu Glu Asp Pro Ala Ser Arg Asp  
 100 105 110

Leu Val Val Asn Tyr Val Asn Thr Asn Met Gly Leu Lys Ile Arg Gln  
 115 120 125

Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg Glu Thr Val  
 130 135 140

Leu Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Pro Ala  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu Thr Thr  
 165 170 175

Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr Pro Ser Pro  
 180 185 190

Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser Gln Ser Arg  
 195 200 205

Glu Ser Gln Cys  
 210

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&lt;210&gt; 70

&lt;211&gt; 212

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 70

Met	Gln	Leu	Phe	His	Leu	Cys	Leu	Ile	Ile	Ser	Cys	Ser	Cys	Pro	Thr
1				5					10					15	

Val	Gln	Ala	Ser	Lys	Leu	Cys	Leu	Gly	Trp	Leu	Trp	Gly	Met	Asp	Ile
			20					25					30		

Asp	Pro	Tyr	Lys	Glu	Phe	Gly	Ala	Thr	Val	Glu	Leu	Leu	Ser	Phe	Leu
		35					40					45			

Pro	Ser	Ala	Phe	Phe	Pro	Ser	Val	Arg	Asp	Leu	Leu	Asp	Thr	Ala	Ser
	50					55					60				

Ala	Leu	Tyr	Arg	Glu	Ala	Leu	Glu	Ser	Pro	Glu	His	Cys	Ser	Pro	His
65					70					75					80

His	Thr	Ala	Leu	Arg	Gln	Ala	Ile	Leu	Cys	Trp	Gly	Asp	Leu	Met	Thr
			85					90						95	

Leu	Ala	Thr	Trp	Val	Gly	Val	Asn	Leu	Glu	Asp	Pro	Ala	Ser	Arg	Asp
			100					105					110		

Leu	Val	Val	Ser	Tyr	Val	Asn	Thr	Asn	Met	Gly	Leu	Lys	Phe	Arg	Gln
		115					120					125			

Leu	Leu	Trp	Phe	His	Ile	Ser	Cys	Leu	Thr	Phe	Gly	Arg	Glu	Thr	Val
	130					135					140				

Ile	Glu	Tyr	Leu	Val	Ser	Phe	Gly	Val	Trp	Ile	Arg	Thr	Pro	Pro	Ala
145					150					155					160

Tyr	Arg	Pro	Pro	Asn	Ala	Pro	Ile	Leu	Ser	Thr	Leu	Pro	Glu	Thr	Thr
				165					170					175	

Val	Val	Arg	Arg	Arg	Gly	Arg	Ser	Pro	Arg	Arg	Arg	Thr	Pro	Ser	Pro
			180					185					190		

Arg	Arg	Arg	Arg	Ser	Gln	Ser	Pro	Arg	Arg	Arg	Arg	Ser	Gln	Ser	Arg
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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195

200

205

Glu Ser Gln Cys  
210

&lt;210&gt; 71

&lt;211&gt; 183

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 71

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly<sup>1</sup> Ala Thr Val Glu Leu Leu  
1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
20 25 30

Thr Ala Ala Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Asn Asn Leu Glu Asp Pro Ala  
65 70 75 80

Ser Arg Asp Leu Val Val Asn Tyr Val Asn Thr Asn Met Gly Leu Lys  
85 90 95

Ile Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
100 105 110

Glu Thr Val Leu Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
130 135 140

Glu Thr Thr Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
165 170 175

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Gln Ser Arg Glu Ser Gln Cys  
180

<210> 72

<211> 183

<212> PRT

<213> Hepatitis B virus

<400> 72

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Gly Asn Leu Glu Asp Pro Ile  
65 70 75 80

Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Met Gly Leu Lys  
85 90 95

Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
100 105 110

Glu Thr Val Ile Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
130 135 140

Glu Thr Cys Val Val Arg Arg Arg Gly Arg Ser Pro Arg Arg Arg Thr  
145 150 155 160

Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg Arg Ser  
165 170 175

Gln Ser Arg Gly Ser Gln Cys  
180

-65-

&lt;210&gt; 73

&lt;211&gt; 188

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 73

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ser Ser Tyr Gln Leu Leu  
 1 5 10 15

Asn Phe Leu Pro Leu Asp Phe Phe Pro Asp Leu Asn Ala Leu Val Asp  
 20 25 30

Thr Ala Thr Ala Leu Tyr Glu Glu Glu Leu Thr Gly Arg Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Ile Arg Gln Ala Leu Val Cys Trp Asp Glu  
 50 55 60

Leu Thr Lys Leu Ile Ala Trp Met Ser Ser Asn Ile Thr Ser Glu Gln  
 65 70 75 80

Val Arg Thr Ile Ile Val Asn His Val Asn Asp Thr Trp Gly Leu Lys  
 85 90 95

Val Arg Gln Ser Leu Trp Phe His Leu Ser Cys Leu Thr Phe Gly Gln  
 100 105 110

His Thr Val Gln Glu Phe Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Ala Pro Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu His Thr Val Ile Arg Arg Arg Gly Gly Ala Arg Ala Ser Arg Ser  
 145 150 155 160

Pro Arg Arg Arg Thr Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro  
 165 170 175

Arg Arg Arg Arg Ser Gln Ser Pro Ser Thr Asn Cys  
 180 185

&lt;210&gt; 74

-66-

&lt;211&gt; 217

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 74

Met Tyr Leu Phe His Leu Cys Leu Val Phe Ala Cys Val Pro Cys Pro  
 1 5 10 15

Thr Val Gln Ala Ser Lys Leu Cys Leu Gly Trp Leu Trp Asp Met Asp  
 20 25 30

Ile Asp Pro Tyr Lys Glu Phe Gly Ser Ser Tyr Gln Leu Leu Asn Phe  
 35 40 45

Leu Pro Leu Asp Phe Phe Pro Asp Leu Asn Ala Leu Val Asp Thr Ala  
 50 55 60

Ala Ala Leu Tyr Glu Glu Glu Leu Thr Gly Arg Glu His Cys Ser Pro  
 65 70 75 80

His His Thr Ala Ile Arg Gln Ala Leu Val Cys Trp Glu Glu Leu Thr  
 85 90 95

Arg Leu Ile Thr Trp Met Ser Glu Asn Thr Thr Glu Glu Val Arg Arg  
 100 105 110

Ile Ile Val Asp His Val Asn Asn Thr Trp Gly Leu Lys Val Arg Gln  
 115 120 125

Thr Leu Trp Phe His Leu Ser Cys Leu Thr Phe Gly Gln His Thr Val  
 130 135 140

Gln Glu Phe Leu Val Ser Phe Gly Val Trp Ile Arg Thr Pro Ala Pro  
 145 150 155 160

Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro Glu His Thr  
 165 170 175

Val Ile Arg Arg Arg Gly Gly Ser Arg Ala Ala Arg Ser Pro Arg Arg  
 180 185 190

Arg Thr Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg  
 195 200 205



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Arg Ser Gln Ser Pro Ala Ser Asn Cys  
 210 215

<210> 75

<211> 262

<212> PRT

<213> Hepatitis B virus

<400> 75

Met Asp Val Asn Ala Ser Arg Ala Leu Ala Asn Val Tyr Asp Leu Pro  
 1 5 10 15

Asp Asp Phe Phe Pro Lys Ile Glu Asp Leu Val Arg Asp Ala Lys Asp  
 20 25 30

Ala Leu Glu Pro Tyr Trp Lys Ser Asp Ser Ile Lys Lys His Val Leu  
 35 40 45

Ile Ala Thr His Phe Val Asp Leu Ile Glu Asp Phe Trp Gln Thr Thr  
 50 55 60

Gln Gly Met His Glu Ile Ala Glu Ala Ile Arg Ala Val Ile Pro Pro  
 65 70 75 80

Thr Thr Ala Pro Val Pro Ser Gly Tyr Leu Ile Gln His Asp Glu Ala  
 85 90 95

Glu Glu Ile Pro Leu Gly Asp Leu Phe Lys Glu Gln Glu Glu Arg Ile  
 100 105 110

Val Ser Phe Gln Pro Asp Tyr Pro Ile Thr Ala Arg Ile His Ala His  
 115 120 125

Leu Lys Ala Tyr Ala Lys Ile Asn Glu Glu Ser Leu Asp Arg Ala Arg  
 130 135 140

Arg Leu Leu Trp Trp His Tyr Asn Cys Leu Leu Trp Gly Glu Ala Thr  
 145 150 155 160

Val Thr Asn Tyr Ile Ser Arg Leu Arg Thr Trp Leu Ser Thr Pro Glu  
 165 170 175

Lys Tyr Arg Gly Arg Asp Ala Pro Thr Ile Glu Ala Ile Thr Arg Pro  
 180 185 190

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Ile Gln Val Ala Gln Gly Gly Arg Lys Thr Ser Thr Ala Thr Arg Lys  
 195 200 205

Pro Arg Gly Leu Glu Pro Arg Arg Arg Lys Val Lys Thr Thr Val Val  
 210 215 220

Tyr Gly Arg Arg Arg Ser Lys Ser Arg Glu Arg Arg Ala Ser Ser Pro  
 225 230 235 240

Gln Arg Ala Gly Ser Pro Leu Pro Arg Ser Ser Ser Ser His His Arg  
 245 250 255

Ser Pro Ser Pro Arg Lys  
 260

<210> 76

<211> 305

<212> PRT

<213> Hepatitis B virus

<400> 76

Met Trp Asp Leu Arg Leu His Pro Ser Pro Phe Gly Ala Ala Cys Gln  
 1 5 10 15

Gly Ile Phe Thr Ser Ser Leu Leu Leu Phe Leu Val Thr Val Pro Leu  
 20 25 30

Val Cys Thr Ile Val Tyr Asp Ser Cys Leu Cys Met Asp Ile Asn Ala  
 35 40 45

Ser Arg Ala Leu Ala Asn Val Tyr Asp Leu Pro Asp Asp Phe Phe Pro  
 50 55 60

Lys Ile Asp Asp Leu Val Arg Asp Ala Lys Asp Ala Leu Glu Pro Tyr  
 65 70 75 80

Trp Arg Asn Asp Ser Ile Lys Lys His Val Leu Ile Ala Thr His Phe  
 85 90 95

Val Asp Leu Ile Glu Asp Phe Trp Gln Thr Thr Gln Gly Met His Glu  
 100 105 110

Ile Ala Glu Ala Leu Arg Ala Ile Ile Pro Ala Thr Thr Ala Pro Val

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115                                      120                                      125  
 Pro Gln Gly Phe Leu Val Gln His Glu Glu Ala Glu Glu Ile Pro Leu  
     130                                      135                                      140  
 Gly Glu Leu Phe Arg Tyr Gln Glu Glu Arg Leu Thr Asn Phe Gln Pro  
     145                                      150                                      155                                      160  
 Asp Tyr Pro Val Thr Ala Arg Ile His Ala His Leu Lys Ala Tyr Ala  
                                     165                                      170                                      175  
 Lys Ile Asn Glu Glu Ser Leu Asp Arg Ala Arg Arg Leu Leu Trp Trp  
                                     180                                      185                                      190  
 His Tyr Asn Cys Leu Leu Trp Gly Glu Pro Asn Val Thr Asn Tyr Ile  
                                     195                                      200                                      205  
 Ser Arg Leu Arg Thr Trp Leu Ser Thr Pro Glu Lys Tyr Arg Gly Lys  
     210                                      215                                      220  
 Asp Ala Pro Thr Ile Glu Ala Ile Thr Arg Pro Ile Gln Val Ala Gln  
     225                                      230                                      235                                      240  
 Gly Gly Arg Asn Lys Thr Gln Gly Val Arg Lys Ser Arg Gly Leu Glu  
                                     245                                      250                                      255  
 Pro Arg Arg Arg Arg Val Lys Thr Thr Ile Val Tyr Gly Arg Arg Arg  
                                     260                                      265                                      270  
 Ser Lys Ser Arg Glu Arg Arg Ala Pro Thr Pro Gln Arg Ala Gly Ser  
                                     275                                      280                                      285  
 Pro Leu Pro Arg Thr Ser Arg Asp His His Arg Ser Pro Ser Pro Arg  
     290                                      295                                      300

Glu  
305

&lt;210&gt; 77

&lt;211&gt; 185

&lt;212&gt; PRT

&lt;213&gt; Hepatitis B virus

&lt;400&gt; 77

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Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
 20 25 30

Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
 35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
 50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Asn Asn Leu Glu Asp Pro Ala  
 65 70 75 80

Ser Arg Asp Leu Val Val Asn Tyr Val Asn Thr Asn Met Gly Leu Lys  
 85 90 95

Ile Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
 100 105 110

Glu Thr Val Leu Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
 115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
 130 135 140

Glu Thr Thr Val Val Arg Arg Arg Asp Arg Gly Arg Ser Pro Arg Arg  
 145 150 155 160

Arg Thr Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg  
 165 170 175

Arg Ser Gln Ser Arg Glu Ser Gln Cys  
 180 185

<210> 78

<211> 152

<212> PRT

<213> Hepatitis B virus

<400> 78

Met Asp Ile Asp Pro Tyr Lys Glu Phe Gly Ala Thr Val Glu Leu Leu  
 1 5 10 15

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Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
20 25 30

Thr Ala Ala Ala Leu Tyr Arg Asp Ala Leu Glu Ser Pro Glu His Cys  
35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Asp  
50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Thr Asn Leu Glu Asp Gly Gly  
65 70 75 80

Lys Gly Gly Ser Arg Asp Leu Val Val Ser Tyr Val Asn Thr Asn Val  
85 90 95

Gly Leu Lys Phe Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr  
100 105 110

Phe Gly Arg Glu Thr Val Leu Glu Tyr Leu Val Ser Phe Gly Val Trp  
115 120 125

Ile Arg Thr Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser  
130 135 140

Thr Leu Pro Glu Thr Thr Val Val  
145 150

<210> 79

<211> 3635

<212> DNA

<213> Artificial Sequence

<220>

<223> plasmid pAP283-58

<400> 79

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gtggtcggat ccaactcgtt tatcaactac attttcagca agtctgttac gccaacgtgt 240  
taaagttggt atagccgaac tgaataatgt ttcagggtcaa tatgtatctg ttataagcg 300

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tectgcacct aaaccggaag gttgtgcaga tgcctgtgtc attatgccga atgaaaacca	360
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&lt;210&gt; 80

&lt;211&gt; 131

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

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&lt;223&gt; AP205 coat protein

&lt;400&gt; 80

Met Ala Asn Lys Pro Met Gln Pro Ile Thr Ser Thr Ala Asn Lys Ile  
 1 5 10 15

Val Trp Ser Asp Pro Thr Arg Leu Ser Thr Thr Phe Ser Ala Ser Leu  
 20 25 30

Leu Arg Gln Arg Val Lys Val Gly Ile Ala Glu Leu Asn Asn Val Ser  
 35 40 45

Gly Gln Tyr Val Ser Val Tyr Lys Arg Pro Ala Pro Lys Pro Glu Gly  
 50 55 60

Cys Ala Asp Ala Cys Val Ile Met Pro Asn Glu Asn Gln Ser Ile Arg  
 65 70 75 80

Thr Val Ile Ser Gly Ser Ala Glu Asn Leu Ala Thr Leu Lys Ala Glu  
 85 90 95

Trp Glu Thr His Lys Arg Asn Val Asp Thr Leu Phe Ala Ser Gly Asn  
 100 105 110

Ala Gly Leu Gly Phe Leu Asp Pro Thr Ala Ala Ile Val Ser Ser Asp  
 115 120 125

Thr Thr Ala  
 130

&lt;210&gt; 81

&lt;211&gt; 131

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; AP205 coat protein

&lt;400&gt; 81

Met Ala Asn Lys Thr Met Gln Pro Ile Thr Ser Thr Ala Asn Lys Ile  
 1 5 10 15

Val Trp Ser Asp Pro Thr Arg Leu Ser Thr Thr Phe Ser Ala Ser Leu  
 20 25 30



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Leu Arg Gln Arg Val Lys Val Gly Ile Ala Glu Leu Asn Asn Val Ser  
 35 40 45

Gly Gln Tyr Val Ser Val Tyr Lys Arg Pro Ala Pro Lys Pro Glu Gly  
 50 55 60

Cys Ala Asp Ala Cys Val Ile Met Pro Asn Glu Asn Gln Ser Ile Arg  
 65 70 75 80

Thr Val Ile Ser Gly Ser Ala Glu Asn Leu Ala Thr Leu Lys Ala Glu  
 85 90 95

Trp Glu Thr His Lys Arg Asn Val Asp Thr Leu Phe Ala Ser Gly Asn  
 100 105 110

Ala Gly Leu Gly Phe Leu Asp Pro Thr Ala Ala Ile Val Ser Ser Asp  
 115 120 125

Thr Thr Ala  
 130

<210> 82

<211> 3607

<212> DNA

<213> Artificial Sequence

<220>

<223> plasmid pAP281-32

<400> 82

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tctccgggag ctgcatgtgt cagaggtttt caccgtcatc accgaaacgc gcgaggcagc	1260
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